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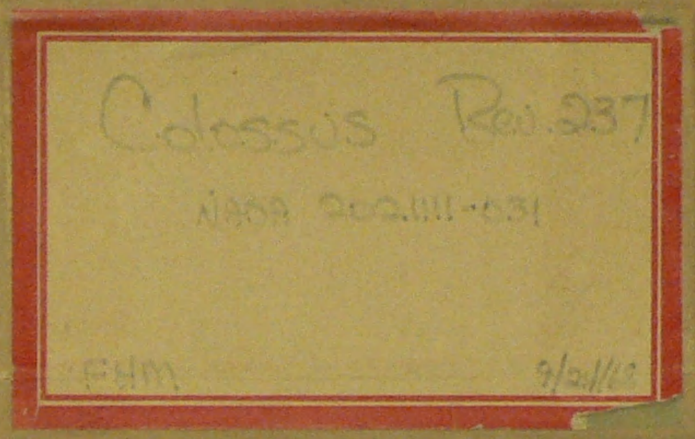

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R0045                   LUNAR LANDMARK SELECTION FOR CM
R0046           DAPCSM
R0047                   TVCINITIALIZE
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R0048		TVCEXECUTIVE
R0049		TVCMASSPROP
R0050		TVCRESTARTS
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R0059		JET SELECTION LOGIC
R0060		CM ENTRY DIGITAL AUTOPILOT
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R0063		INTER-BANK COMMUNICATION
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R0081		PHASE TABLE MAINTENANCE
R0082		RESTARTS ROUTINE
R0083		IMU MODE SWITCHING ROUTINES
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R0085		DISPLAY INTERFACE ROUTINES
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R0087		ALARM AND ABORT
R0088		UPDATE PROGRAM
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R0096 PARAGRAPHS GENERATED FOR THIS ASSEMBLY
R0097 OCTAL LISTING
R0098 OCCUPIED LOCATIONS TABLE
R0099 SUBROS CALLED & PROGRAM STATUS

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P0100 VERB LIST FOR CSM

R0101 REGULAR VERBS

R0102 00 NO1 IN LSE
R0103 01 DISPLAY OCTAL COMP 1 IN R1
R0104 02 DISPLAY OCTAL COMP 2 IN R1
R0105 03 DISPLAY OCTAL COMP 3 IN R1
R0106 04 DISPLAY OCTAL COMP 1,2 IN R1,R2
R0107 05 DISPLAY OCTAL COMP 1,2,3 IN R1,R2,R3
R0108 06 DISPLAY DECIMAL IN R1 OR R1,R2 OR R1,R2,R3
R0109 07 DISPLAY DP DECIMAL IN R1,R2 (TEST ONLY)
R0110 08
R0111 09
R0112 10
R0113 11 MONITOR OCTAL COMP 1 IN R1
R0114 12 MONITOR OCTAL COMP 2 IN R1
R0115 13 MONITOR OCTAL COMP 3 IN R1
R0116 14 MONITOR OCTAL COMP 1,2 IN R1,R2
R0117 15 MONITOR OCTAL COMP 1,2,3 IN R1,R2,R3
R0118 16 MONITOR DECIMAL IN R1 OR R1,R2 OR R1,R2,R3
R0119 17 MONITOR DP DECIMAL IN R1,R2 (TEST ONLY)
R0120 18
R0121 19
R0122 20
R0123 21 LOAD COMPONENT 1 INTO R1
R0124 22 LOAD COMPONENT 2 INTO R2
R0125 23 LOAD COMPONENT 3 INTO R3
R0126 24 LOAD COMPONENT 1,2 INTO R1,R2
R0127 25 LOAD COMPONENT 1,2,3 INTO R1,R2,R3
R0128 26
R0129 27 DISPLAY FIXED MEMORY
R0130 28
R0131 29
R0132 30 REQUEST EXECUTIVE
R0133 31 REQUEST WAITLIST
R0134 32 RECYCLE PROGRAM
R0135 33 PROCEED WITHOUT DSKY INPUTS
R0136 34 TERMINATE FUNCTION
R0137 35 TEST LIGHTS
R0138 36 REQUEST FRESH START
R0139 37 CHANGE PROGRAM (MAJOR MODE)
R0140 38
R0141 39

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P0142 EXTENDED VERBS

R0143 40 ZERO CDU-S
R0144 41 COARSE ALIGN CDU-S
R0145 42 FINE ALIGN IMU-S
R0146 43 LOAD IML ATT ERROR METERS
R0147 44 SET SURFACE FLAG
R0148 45 RESET SURFACE FLAG
R0149 46 ESTABLISH G+C CONTROL
R0150 47 MOVE LM STATE VECTOR INTO CM STATE VECTOR.
R0151 48 REQUEST DAP DATA LOAD ROUTINE (R03)
R0152 49 REQUEST CREW DEFINED MANEUVER ROUTINE (R62)
R0153 50 PLEASE PERFORM
R0154 51 PLEASE MARK
R0155 52 MARK ON OFFSET LANDING SITE
R0156 53 PLEASE PERFORM ALTERNATE LOS MARK
R0157 54 REQUEST RENDEZVOUS BACKUP SIGHTING MARK ROUTINE (R23)
R0158 55 INCREMENT AGC TIME (DECIMAL)
R0159 56 TERMINATE TRACKING (P20 + P25)
R0160 57 REQUEST RENDEZVOUS SIGHTING MARK ROUTINE (R21)
R0161 58 RESET STICK FLAG
R0162 59 PLEASE CALIBRATE
R0163 60 SET ASTRONAUT TOTAL ATTITUDE (N17) TO PRESENT ATTITUDE
R0164 61 DISPLAY DAP ATTITUDE ERROR
R0165 62 DISPLAY TOTAL ATTITUDE ERROR (WRT N22 (THETAD))
R0166 63 DISPLAY TOTAL ASTRONAUT ATTITUDE ERROR (WRT N17 (CPHIX))
R0167 64 REQUEST S-BAND ANTENNA ROUTINE
R0168 65 OPTICAL VERIFICATION OF PRELAUNCH ALIGNMENT
R0169 66 VEHICLES ARE ATTACHED. MOVE THIS VEHICLE STATE TO OTHER VEHICLE.
R0170 67
R0171 68 CSM STRCKE TEST ON
R0172 69 CAUSE RESTART
R0173 70 UPDATE LIFTOFF TIME
R0174 71 UNIVERSAL UPDATE-BLOCK ADR
R0175 72 UNIVERSAL UPDATE-SINGLE ADR
R0176 73 UPDATE AGC TIME (OCTAL)
R0177 74 INITIALIZE ERASABLE DUMP VIA DOWNLINK
R0178 75 BACKUP LIFTOFF
R0179 76 SET PREFERRED ATTITUDE FLAG
R0180 77 RESET PREFERRED ATTITUDE FLAG
R0181 78 UPDATE PRELAUNCH AZIMUTH
R0182 79 REQUEST LUNAR LANDMARK SELECTION ROUTINE (R35)
R0183 80 UPDATE LEM STATE VECTOR
R0184 81 UPDATE CSM STATE VECTOR
R0185 82 REQUEST ORBIT PARAM DISPLAY (R30)
R0186 83 REQUEST REND PARAM DISPLAY (R31)
R0187 84 START TARGET DELTA V (R32)
R0188 85 REQUEST RENDEZVOUS PARAMETER DISPLAY NO. 2 (R34)
R0189 86 REJECT RENDEZVOUS BACKUP SIGHTING MARK
R0190 87 SET VHF RANGE FLAG

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R0191 88 RESET VHF RANGE FLAG
R0192 89 REQUEST RENDEZVOUS FINAL ATTITUDE ROUTINE (R63)
R0193 90 REQUEST RENDEZVOUS OUT OF PLANE DISPLAY ROUTINE (R36)
R0194 91 DISPLAY BANK SUM
R0195 92 OPERATE IMU PERFORMANCE TEST (P07)
R0196 93 ENABLE V MATRIX INITIALIZATION
R0197 94 PERFORM CYSLUNAR ATTITUDE MANEUVER (P23)
R0198 95 NO UPDATE OF EITHER STATE VECTOR (P20 OR P22)
R0199 96 TERMINATE INTEGRATION AND GO TO P00
R0200 97 PERFORM ENGINE FAIL PROCEDURE
R0201 98 ENABLE TRANSLUNAR INJECT
R0202 99 PLEASE ENABLE ENGINE

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R0203 IN THE FOLLOWING NOUN LIST THE :NO LOAD: RESTRICTION MEANS THE NOUN
R0204 CONTAINS AT LEAST ONE COMPONENT WHICH CANNOT BE LOADED, I.E. OF
R0205 SCALE TYPE L (MIN/SEC) OR PP (2 INTEGERS).
R0206 IN THIS CASE VERBS 24 AND 25 ARE NOT ALLOWED, BUT VERBS 21, 22 OR 23
R0207 MAY BE USED TO LOAD ANY OF THE NOUN:S COMPONENTS WHICH ARE NOT OF THE
R0208 ABOVE SCALE TYPES.
R0209 THE :DEC ONLY: RESTRICTION MEANS ONLY DECIMAL OPERATION IS ALLOWED ON
R0210 EVERY COMPONENT IN THE NOUN. (NOTE THAT :NO LOAD: IMPLIES :DEC ONLY:.)

	NORMAL NOUNS	COMPONENTS	SCALE AND DECIMAL POINT	RESTRICTIONS
R0213	00 NOT IN USE			
R0214	01 SPECIFY MACHINE ADDRESS (FRACTIONAL)	3COMP	.XXXXX FOR EACH	
R0215	02 SPECIFY MACHINE ADDRESS (WHOLE)	3COMP	XXXXX. FOR EACH	
R0216	03 SPECIFY MACHINE ADDRESS (DEGREES)	3COMP	XXX.XX DEG FOR EACH	
R0217	04 SPARE			
R0218	05 ANGULAR ERROR/DIFFERENCE	1COMP	XXX.XX DEG	
R0219	06 OPTION CODE	2COMP	OCTAL ONLY FOR EACH	
R0220	LOADING NOUN 07 WILL SET OR RESET SELECTED	BITS IN	ANY ERASABLE REGISTER	
R0221	07 ECADR OF WORD TO BE MODIFIED	3COMP	OCTAL ONLY FOR EACH	
R0222	ONES FOR BITS TO BE MODIFIED			
R0223	1 TO SET OR 0 TO RESET SELECTED BITS			
R0224	08 ALARM DATA	3COMP	OCTAL ONLY FOR EACH	
R0225	09 ALARM CODES	3COMP	OCTAL ONLY FOR EACH	
R0226	10 CHANNEL TO BE SPECIFIED	1COMP	OCTAL ONLY	
R0227	11 SPARE			
R0228	12 OPTION CODE	2COMP	OCTAL ONLY FOR EACH	
R0229	(USED BY EXTENDED VERBS ONLY)			
R0230	13 SPARE			
R0231	14 SPARE			
R0232	15 INCREMENT MACHINE ADDRESS	1COMP	OCTAL ONLY	
R0233	16 TIME OF EVENT	3COMP	00XXX. HRS	DEC ONLY
R0235	(USED BY EXTENDED VERBS ONLY)		000XX. MIN	MUST LOAD 3 COMPS
R0237			0XX.XX SEC	
R0238	17 ASTRONAUT TOTAL ATTITUDE	3COMP	XXX.XX DEG FOR EACH	
R0239	18 ALTO MANEUVER BALL ANGLES	3COMP	XXX.XX DEG FOR EACH	
R0240	19 BYPASS ATTITUDE TRIM MANEUVER	3COMP	XXX.XX DEG FOR EACH	
R0241	20 ICDU ANGLES	3COMP	XXX.XX DEG FOR EACH	
R0242	21 PIPAS	3COMP	XXXXX. PULSES FOR EACH	
R0244	22 NEW ICDU ANGLES	3COMP	XXX.XX DEG FOR EACH	
R0245	23 SPARE			
R0246	24 DELTA TIME FOR AGC CLOCK	3COMP	00XXX. HRS	DEC ONLY
R0248			000XX. MIN	MUST LOAD 3 COMPS
R0250			0XX.XX SEC	
R0251	25 CHECKLIST	3COMP	XXXXX. FOR EACH	
R0252	(USED WITH PLEASE PERFORM ONLY)			
R0253	26 PRIORITY/DELAY, ADRES, BBCON	3COMP	OCTAL ONLY FOR EACH	
R0254	27 SELF TEST ON/OFF SWITCH	1COMP	XXXXX.	
R0255	28 SPARE			
R0256	29 XSM LAUNCH AZIMUTH	1COMP	XXX.XX DEG	DEC ONLY

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R0258	30	TARGET CODES	3COMP	XXXXX. FOR EACH	
R0259	31	TIME OF LANDING SITE	3COMP	00XXX. HRS	DEC ONLY
R0261				000XX. MIN	MUST LOAD 3 COMPS
R0263				0XX.XX SEC	
R0264	32	TIME FROM PERIGEE	3COMP	00XXX. HRS	DEC ONLY
R0266				000XX. MIN	MUST LOAD 3 COMPS
R0268				0XX.XX SEC	
R0269	33	TIME OF IGNITION	3COMP	00XXX. HRS	DEC ONLY
R0271				000XX. MIN	MUST LOAD 3 COMPS
R0273				0XX.XX SEC	
R0274	34	TIME OF EVENT	3COMP	00XXX. HRS	DEC ONLY
R0276				000XX. MIN	MUST LOAD 3 COMPS
R0278				0XX.XX SEC	
R0279	35	TIME FROM EVENT	3COMP	00XXX. HRS	DEC ONLY
R0281				000XX. MIN	MUST LOAD 3 COMPS
R0283				0XX.XX SEC	
R0284	36	TIME OF AGC CLOCK	3COMP	00XXX. HRS	DEC ONLY
R0286				000XX. MIN	MUST LOAD 3 COMPS
R0288				0XX.XX SEC	
R0289	37	TIG OF TPI	3COMP	00XXX. HRS	DEC ONLY
R0291				000XX. MIN	MUST LOAD 3 COMPS
R0293				0XX.XX SEC	
R0294	38	TIME OF STATE VECTOR	3COMP	00XXX. HRS	DEC ONLY
R0296				000XX. MIN	MUST LOAD 3 COMPS
R0298				0XX.XX SEC	
R0299	39	DELTA TIME FOR TRANSFER	3COMP	00XXX. HRS	DEC ONLY
R0301				000XX. MIN	MUST LOAD 3 COMPS
R0303				0XX.XX SEC	

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P0304	MIXED NOUNS		COMPONENTS	SCALE AND DECIMAL POINT	RESTRICTIONS
R0306	40	TIME FROM IGNITION/CUTOFF	3COMP	XXBXX MIN/SEC	NO LOAD, DEC ONLY
R0308		VG,		XXXX.X FT/SEC	
R0309		DELTA V (ACCUMULATED)		XXXX.X FT/SEC	
R0310	41	TARGET AZIMUTH,	2COMP	XXX.XX DEG	
R0311		ELEVATION		XX.XXX DEG	
R0312	42	APOGEE,	3COMP	XXXX.X NAUT MI	DEC ONLY
R0314		PERIGEE,		XXXX.X NAUT MI	
R0315		DELTA V (REQUIRED)		XXXX.X FT/SEC	
R0316	43	LATITUDE,	3COMP	XXX.XX DEG	DEC ONLY
R0318		LONGITUDE,		XXX.XX DEG	
R0319		ALTITUDE		XXXX.X NAUT MI	
R0320	44	APOGEE,	3COMP	XXXX.X NAUT MI	NO LOAD, DEC ONLY
R0322		PERIGEE,		XXXX.X NAUT MI	
R0323		TFF		XXBXX MIN/SEC	
R0324	45	MARKS (VHF - OPTICS)	3 COMP	+XXBXX	NO LOAD, DEC ONLY
R0326		TFI OF NEXT BURN		XXBXX MIN/SEC	
R0327		MGA		XXX.XX DEG	
R0328	46	AUTOPILOT CONFIGURATION	2COMP	OCTAL ONLY FOR EACH	
R0329	47	THIS VEHICLE WEIGHT	2COMP	XXXXX. LBS	DEC ONLY
R0331		OTHER VEHICLE WEIGHT		XXXXX. LBS	
R0332	48	PITCH TRIM	2COMP	XXX.XX DEG	DEC ONLY
R0334		YAW TRIM,		XXX.XX DEG	
R0335	49	DELTA R	3COMP	XXXX.X NAUT MI	DEC ONLY
R0337		DELTA V		XXXX.X FT/SEC	
R0338		VHF OR OPTICS CODE		XXXXX.	
R0339	50	SPLASH ERROR,	3COMP	XXXX.X NAUT MI	NO LOAD, DEC ONLY
R0341		PERIGEE,		XXXX.X NAUT MI	
R0342		TFF		XXBXX MIN/SEC	
R0343	51	S-BAND ANTENNA ANGLES PITCH	2COMP	XXX.XX DEG	DEC ONLY
R0345		YAW		XXX.XX DEG	
R0346	52	CENTRAL ANGLE OF ACTIVE VEHICLE	1COMP	XXX.XX DEG	
R0347	53	RANGE,	3COMP	XXX.XX NAUT MI	DEC ONLY
R0349		RANGE RATE,		XXXX.X FT/SEC	
R0350		PHI		XXX.XX DEG	
R0351	54	RANGE,	3COMP	XXX.XX NAUT MI	DEC ONLY
R0353		RANGE RATE,		XXXX.X FT/SEC	
R0354		THETA		XXX.XX DEG	
R0355	55	PERIGEE CODE	3COMP	XXXXX.	DEC ONLY
R0357		ELEVATION ANGLE		XXX.XX DEG	
R0358		CENTRAL ANGLE OF PASSIVE VEHICLE		XXX.XX DEG	
R0359	56	REENTRY ANGLE,	2COMP	XXX.XX DEG	DEC ONLY
R0361		DELTA V		XXXXX. FT/SEC	
R0362	57	DELTA R	1COMP	XXXX.X NAUT MI	DEC ONLY
R0364	58	PERIGEE ALT (POST TPI)	3COMP	XXXX.X NAUT MI	DEC ONLY
R0366		DELTA V TPI		XXXX.X FT/SEC	
R0367		DELTA V TPF		XXXX.X FT/SEC	
R0368	59	DELTA VELOCITY LOS	3COMP	XXXX.X FT/SEC FOR EA.	DEC ONLY
R0370	60	GMAX,	3COMP	XXX.XX G	DEC ONLY

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R0372		VPRED,		XXXXX. FT/SEC	
R0373		GAMMA EI		XXX.XX DEG	
R0374	61	IMPACT LATITUDE,	3COMP	XXX.XX DEG	DEC ONLY
R0376		IMPACT LONGITUDE,		XXX.XX DEG	
R0377		HEADS UP/DOWN		+/- 00001	
R0378	62	INERTIAL VEL MAG (VI),	3COMP	XXXXX. FT/SEC	DEC ONLY
R0380		ALT RATE CHANGE (HDOT),		XXXXX. FT/SEC	
R0381		ALT ABOVE PAD RADIUS (H)		XXXX.X NAUT MI	
R0382	63	RANGE 297,431 TO SPLASH (RTGO),	3COMP	XXXX.X NAUT MI	NO LOAD, DEC ONLY
R0384		PREDICTED INERT VEL (VIO),		XXXXX. FT/SEC	
R0385		TIME FROM 297,431 (TFE)		XXBXX MIN/SEC	
R0386	64	DRAG ACCELERATION,	3COMP	XXX.XX G	DEC ONLY
R0388		INERTIAL VELOCITY (VI),		XXXXX. FT/SEC	
R0389		RANGE TO SPLASH		XXXX.X NAUT MI	
R0390	65	SAMPLED AGC TIME	3COMP	00XXX. HRS	DEC ONLY
R0392		(FETCHED IN INTERRUPT)		000XX. MIN	MUST LOAD 3 COMPS
R0394				0XX.XX SEC	
R0395	66	COMMAND BANK ANGLE (BETA),	3COMP	XXX.XX DEG	DEC ONLY
R0397		CROSS RANGE ERROR,		XXXX.X NAUT MI	
R0398		DOWN RANGE ERROR		XXXX.X NAUT MI	
R0399	67	RANGE TO TARGET,	3COMP	XXXX.X NAUT MI	DEC ONLY
R0401		PRESENT LATITUDE,		XXX.XX DEG	
R0402		PRESENT LONGITUDE		XXX.XX DEG	
R0403	68	COMMAND BANK ANGLE (BETA),	3COMP	XXX.XX DEG	DEC ONLY
R0405		INERTIAL VELOCITY (VI),		XXXXX. FT/SEC	
R0406		ALT RATE CHANGE (RDOT)		XXXXX. FT/SEC	
R0407	69	BETA	3COMP	XXX.XX DEG	DEC ONLY
R0409		DL		XXX.XX G	
R0410		VL		XXXXX. FT/SEC	
R0411	70	STAR CODE,	3COMP	OCTAL ONLY	
R0412		LANDMARK DATA,		OCTAL ONLY	
R0413		HORIZON DATA		OCTAL ONLY	
R0414	71	STAR CODE	3COMP	OCTAL ONLY	
R0415		LANDMARK DATA		OCTAL ONLY	
R0416		HORIZON DATA		OCTAL ONLY	
R0417	72	DELT ANG	3COMP	XXX.XX DEG	DEC ONLY
R0419		DELT ALT		XXXX.X NAUT MI	
R0420		SEARCH OPTION		XXXXX.	
R0421	73	SPARE			
R0422	74	SPARE			
R0423	75	SPARE			
R0424	76	SPARE			
R0425	77	SPARE			
R0426	78	SPARE			
R0427	79	SPARE			
R0428	80	TIME FROM IGNITION/CUTOFF	3COMP	XXBXX MIN/SEC	NO LOAD, DEC ONLY
R0430		VC		XXXXX. FT/SEC	
R0431		DELTA V (ACCUMULATED)		XXXXX. FT/SEC	
R0432	81	DELTA V (LV)	3COMP	XXXX.X FT/SEC FOR EACH	DEC ONLY

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R0434	82	SPARE			
R0435	83	DELTA V (BODY)	3COMP	XXXX.X FT/SEC FOR EACH	DEC ONLY
R0437	84	DELTA V (OTHER VEHICLE)	3COMP	XXXX.X FT/SEC FOR EACH	DEC ONLY
R0439	85	VG (BODY)	3COMP	XXXX.X FT/SEC FOR EACH	DEC ONLY
R0441	86	DELTA V(LV)	3COMP	XXXXX. FT/SEC FOR EACH	DEC ONLY
R0443	87	MARK DATA SHAFT,	2COMP	XXX.XX DEG	
R0444		TRUNION		XX.XXX DEG	
R0445	88	HALF UNIT SUN OR PLANET VECTOR	3COMP	.XXXXX FOR EACH	DEC ONLY
R0447	89	LANDMARK LATITUDE,	3COMP	XX.XXX DEG	DEC ONLY
R0449		LONGITUDE/2,		XX.XXX DEG	
R0450		ALTITUDE		XXX.XX NAUT MI	
R0451	90	Y	3COMP	XXX.XX NM	DEC ONLY
R0453		Y DOT		XXXX.X FPS	
R0454		PSI		XXX.XX DEG	
R0455	91	OCDU ANGLES SHAFT,	2COMP	XXX.XX DEG	
R0456		TRUNION		XX.XXX DEG	
R0457	92	NEW OPTICS ANGLES SHAFT,	2COMP	XXX.XX DEG	
R0458		TRUNION		XX.XXX DEG	
R0459	93	DELTA GYRO ANGLES	3COMP	XX.XXX DEG FOR EACH	
R0460	94	NEW OPTICS ANGLES SHAFT	2COMP	XXX.XX DEG	
R0461		TRUNNION		XX.XXX DEG	
R0462	95	PREFERRED ATTITUDE ICDU ANGLES	3COMP	XXX.XX DEG FOR EACH	
R0463	96	+X-AXIS ATTITUDE ICDU ANGLES	3COMP	XXX.XX DEG FOR EACH	
R0464	97	SYSTEM TEST INPUTS	3COMP	XXXXX. FOR EACH	
R0465	98	SYSTEM TEST RESULTS AND INPUTS	3COMP	XXXXX.	
R0466				.XXXXX	
R0467				XXXXX.	
R0468	99	RMS IN POSITION	3COMP	XXX.XX NAUT MI	DEC ONLY
R0470		RMS IN VELOCITY		XXXX.X FT/SEC	
R0471		RMS OPTION		XXXXX.	

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P0472 REGISTERS AND SCALING FOR NORMAL NOUNS

R0473	NOUN	REGISTER	SCALE TYPE
R0474	00	NOT IN USE	
R0475	01	SPECIFY ADDRESS	B
R0476	02	SPECIFY ADDRESS	C
R0477	03	SPECIFY ADDRESS	D
R0478	04	SPARE	
R0479	05	DSPTEM1	H
R0480	06	OPTION1	A
R0481	07	XREG	A
R0482	08	ALMCADR	A
R0483	09	FAILREG	A
R0484	10	SPECIFY CHANNEL	A
R0485	11	SPARE	
R0486	12	OPTIONX	A
R0487	13	SPARE	
R0488	14	SPARE	
R0489	15	INCREMENT ADDRESS	A
R0490	16	DSPTEMX	C
R0491	17	CPHIX	D
R0492	18	THETAD	D
R0493	19	THETAD	D
R0494	20	CDUX	D
R0495	21	PIPAX	C
R0496	22	THETAD	D
R0497	23	SPARE	
R0498	24	DSPTEM2 +1	K
R0499	25	DSPTEM1	C
R0500	26	DSPTEM1	A
R0501	27	SMODE	C
R0502	28	SPARE	
R0503	29	DSPTEM1	D
R0504	30	DSPTEM1	C
R0505	31	DSPTEM1	K
R0506	32	-TPER	K
R0507	33	TIG	K
R0508	34	DSPTEM1	K
R0509	35	TTOGO	K
R0510	36	TIME2	K
R0511	37	TTPI	K
R0512	38	TET	K
R0513	39	T3TOT4	K

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P0514 REGISTERS AND SCALING FOR MIXED NOUNS

R0515	NOUN	COMP	REGISTER	SCALE TYPE
R0516	40	1	TTOGO	L
R0517		2	VGDISP	S
R0518		3	DVTOTAL	S
R0519	41	1	DSPTEM1	D
R0520		2	DSPTEM1 +1	E
R0521	42	1	HAPO	Q
R0522		2	HPER	Q
R0523		3	VGDISP	S
R0524	43	1	LAT	H
R0525		2	LONG	H
R0526		3	ALT	Q
R0527	44	1	HAPOX	Q
R0528		2	HPERX	Q
R0529		3	TFF	L
R0530	45	1	VHFCNT	PP
R0531		2	TTOGO	L
R0532		3	+MGA	H
R0533	46	1	DAPDATR1	A
R0534		2	DAPDATR2	A
R0535	47	1	CSMMASS	KK
R0536		2	LEMMASS	KK
R0537	48	1	PACTOFF	FF
R0538		2	YACTOFF	FF
R0539	49	1	N49DISP	Q
R0540		2	N49DISP +2	S
R0541		3	N49DISP +4	C
R0542	50	1	RSP-RREC	LL
R0543		2	HPERX	Q
R0544		3	TFF	L
R0545	51	1	RHOSB	H
R0546		2	GAMMASB	H
R0547	52	1	ACTCENT	H
R0548	53	1	RANGE	JJ
R0549		2	RRATE	S
R0550		3	RTHETA	H
R0551	54	1	RANGE	JJ
R0552		2	RRATE	S
R0553		3	RTHETA	H
R0554	55	1	NN1	C
R0555		2	ELEV	H
R0556		3	CENTANG	H
R0557	56	1	RTEGAM2D	H
R0558		2	RTEDVD	P
R0559	57	1	DELTAR	Q
R0560	58	1	PCSTTPI	Q
R0561		2	DELVTPI	S

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R0562		3	DELVTPF	S
R0563	59	1	DVLCS	S
R0564		2	DVLCS +2	S
R0565		3	DVLCS +4	S
R0566	60	1	GMAX	T
R0567		2	VPRED	P
R0568		3	GAMMAEI	H
R0569	61	1	LAT(SPL)	H
R0570		2	LNG(SPL)	H
R0571		3	HEADSUP	C
R0572	62	1	VMAGI	P
R0573		2	HDOT	P
R0574		3	ALTI	Q
R0575	63	1	RTGO	LL
R0576		2	VIO	P
R0577		3	TTE	L
R0578	64	1	D	MM
R0579		2	VMAGI	P
R0580		3	RTGCN64	LL
R0581	65	1	SAMPTIME	K
R0582		2	SAMPTIME	K
R0583		3	SAMPTIME	K
R0584	66	1	RCLLC	H
R0585		2	XRNGERR	VV
R0586		3	DRRNGERR	LL
R0587	67	1	RTGON67	LL
R0588		2	LAT	H
R0589		3	LONG	H
R0590	68	1	RCLLC	H
R0591		2	VMAGI	P
R0592		3	RDOT	UU
R0593	69	1	RCLLC	H
R0594		2	Q7	MM
R0595		3	VL	UU
R0596	70	1	STARCODE	A
R0597		2	LANDMARK	A
R0598		3	HORIZON	A
R0599	71	1	STARCODE	A
R0600		2	LANDMARK	A
R0601		3	HORIZON	A
R0602	72	1	THETZERO	H
R0603		2	DELHITE	Q
R0604		3	OPTION2	C
R0605	73	SPARE		
R0606	74	SPARE		
R0607	75	SPARE		
R0608	76	SPARE		
R0609	77	SPARE		
R0610	78	SPARE		
R0611	79	SPARE		

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R0612	80	1	TTOGO	L
R0613		2	VGDISP	P
R0614		3	DVTOTAL	P
R0615	81	1	DELVLVC	S
R0616		2	DELVLVC +2	S
R0617		3	DELVLVC +4	S
R0618	82	SPARE		
R0619	83	1	DELVIMU	S
R0620		2	DELVIMU +2	S
R0621		3	DELVIMU +4	S
R0622	84	1	DELVGV	S
R0623		2	DELVGV +2	S
R0624		3	DELVGV +4	S
R0625	85	1	VGBODY	S
R0626		2	VGBODY +2	S
R0627		3	VGBODY +4	S
R0628	86	1	DELVLVC	P
R0629		2	DELVLVC +2	P
R0630		3	DELVLVC +4	P
R0631	87	1	MRKBUF1 +3	D
R0632		2	MRKBUF1 +5	J
R0633	88	1	STAR	B
R0634		2	STAR +2	B
R0635		3	STAR +4	B
R0636	89	1	LANDLAT	G
R0637		2	LANDLONG	G
R0638		3	LANDALT	JJ
R0639	90	1	RANGE	JJ
R0640		2	RRATE	S
R0641		3	RTHETA	H
R0642	91	1	CDUS	D
R0643		2	CDUT	J
R0644	92	1	SAC	D
R0645		2	PAC	J
R0646	93	1	OGC	G
R0647		2	OGC +2	G
R0648		3	OGC +4	G
R0649	94	1	MRKBUF1 +3	D
R0650		2	MRKBUF1 +5	J
R0651	95	1	PRAXIS	D
R0652		2	PRAXIS +1	D
R0653		3	PRAXIS +2	D
R0654	96	1	CPHIX	D
R0655		2	CPHIX +1	D
R0656		3	CPHIX +2	D
R0657	97	1	DSPTEM1	C
R0658		2	DSPTEM1 +1	C
R0659		3	DSPTEM1 +2	C
R0660	98	1	DSPTEM2	C
R0661		2	DSPTEM2 +1	B

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```
R0662           3       DSPTEM2 +2      C
R0663   99      1       WWPOS           XX
R0664           2       WWVEL           YY
R0665           3       WWOPT           C
```

P0666 NOUN SCALES AND FORMATS

	-SCALE TYPE-	PRECISION	-- AGC FORMAT
R0667			
R0668	UNITS	DECIMAL FORMAT	-- AGC FORMAT
R0669	----------	----------	-- ----------
R0670	-A-		
R0671	OCTAL	XXXXX	SP OCTAL
R0672	-B-		-14
R0673	FRACTIONAL	.XXXXX	SP BIT 1 = 2 UNITS
R0674		(MAX .99996)	
R0675	-C-		
R0676	WHOLE	XXXXX.	SP BIT 1 = 1 UNIT
R0677		(MAX 16383.)	
R0678	-D-		15
R0679	CDU DEGREES	XXX.XX DEGREES	SP BIT 1 = 360/2 DEGREES
R0680		(MAX 359.99)	(USES 15 BITS FOR MAGNI-
R0681			TUDE AND 2-S COMP.)
R0682	-E-		14
R0683	ELEVATION DEGREES	XX.XXX DEGREES	SP BIT 1 = 90/2 DEGREES
R0684		(MAX 89.999)	
R0685	-F-		14
R0686	DEGREES (180)	XXX.XX DEGREES	SP BIT 1 = 180/2 DEGREES
R0687		(MAX 179.99)	
R0688	-G-		
R0689	DP DEGREES(90)	XX.XXX DEGREES	DP BIT 1 OF LOW REGISTER =
R0690			28
R0691			360/2 DEGREES
R0692	-H-		
R0693	DP DEGREES (360)	XXX.XX DEGREES	DP BIT 1 OF LOW REGISTER =
R0694			28
R0695		(MAX 359.99)	360/2 DEGREES
R0696	-J-		15
R0697	Y OPTICS DEGREES	XX.XXX DEGREES	SP BIT 1 = 90/2 DEGREES
R0698		(BIAS OF 19.775	(USES 15 BITS FOR MAGNI-
R0699		DEGREES ADDED FOR	TUDE AND 2-S COMP.)
R0700		DISPLAY, SUBTRACTED	
R0701		FOR LOAD.)	
R0702		NOTE: NEGATIVE NUM-	
R0703		BERS CANNOT BE	
R0704		LOADED.	
R0705	-K-		

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```
R0706   TIME (HR, MIN, SEC)  00XXX. HR              DP BIT 1 OF LOW REGISTER =
R0707                        000XX. MIN                    -2
R0708                        0XX.XX SEC               10    SEC
R0709                        (DECIMAL ONLY.
R0710                        MAX MIN COMP=59
R0711                        MAX SEC COMP=59.99
R0712                        MAX CAPACITY=745 HRS
R0713                                     39 MINS
R0714                                     14.55 SECS.
R0715                        WHEN LOADING, ALL 3
R0716                        COMPONENTS MUST BE
R0717                        SUPPLIED.)

R0718   -L-
R0719   TIME (MIN/SEC)       XX8XX MIN/SEC          DP BIT 1 OF LOW REGISTER =
R0720                        (8 IS A BLANK                 -2
R0721                        POSITION, DECIMAL        10    SEC
R0722                        ONLY, DISPLAY OR
R0723                        MONITOR ONLY. CANNOT
R0724                        BE LOADED.
R0725                        MAX MIN COMP=59
R0726                        MAX SEC COMP=59
R0727                        VALUES GREATER THAN
R0728                        59 MIN 59 SEC
R0729                        ARE DISPLAYED AS
R0730                        59 MIN 59 SEC.)

R0731   -M-                                              -2
R0732   TIME (SEC)          XXX.XX SEC             SP BIT 1 = 10    SEC
R0733                        (MAX 163.83)

R0734   -N-
R0735   TIME(SEC) DP        XXX.XX SEC             DP BIT 1 OF LOW REGISTER =
R0736                                                    -2
R0737                                                  10    SEC

R0738   -P-
R0739   VELOCITY 2          XXXXX. FEET/SEC        DP BIT 1 OF HIGH REGISTER =
R0740                        (MAX 41994.)                -7
R0741                                                  2    METERS/CENTI-SEC

R0742   -Q-
R0743   POSITION 4          XXXX.X NAUTICAL MILES  DP BIT 1 OF LOW REGISTER =
R0744                                                  2 METERS

R0745   -S-
R0746   VELOCITY 3          XXXX.X FT/SEC          DP BIT 1 OF HIGH REGISTER =
R0747                                                   -7
R0748                                                  2    METERS/CENTI-SEC
```

```
R0749   -I-                                          -2
R0750   G                   XXX.XX G          SP BIT 1 = 10   G
R0751                       (MAX 163.83)

R0752   -FF-
R0753   TRIM DEGREES        XXX.XX DEG.       SP LOW ORDER BIT = 85.41 SEC
R0754                       (MAX 388.69)         OF ARC

R0755   -GG-
R0756   INERTIA             XXXXXBB. SLUG FT SQ  SP FRACTIONAL PART OF
R0757                       (MAX 0773388.)          20    2
R0758                                            2  KG M

R0759   -II-                                                    20
R0760   THRUST MOMENT       XXXXXBB. FT LBS   SP FRACTIONAL PART OF 2
R0761                       (MAX 0773388.)       NEWTON METER

R0762   -JJ-
R0763   POSITION5           XXX.XX NAUT MI    DP BIT 1 OF LOW REGISTER =
R0764                                            2 METERS
R0765   -KK-                                                   16
R0766   WEIGHT2             XXXXX. LBS        SP FRACTIONAL PART OF 2   KG

R0767   -LL-
R0768   POSITION6           XXXX.X NAUT MI    DP BIT 1 OF LOW REG =
R0769                                                    -28
R0770                                          (6,373,338)(2(PI))X2
R0771                                          ----------------------
R0772                                                  1852
R0773                                          NAUT. MI.

R0774   -MM-
R0775   DRAG ACCELERATION   XXX.XX G           DP BIT 1 OF LOW REGISTER =
R0776                       MAX (024.99)             -28
R0777                                            25X2    G

R0778   -PP-
R0779   2 INTEGERS          +XXBYY            DP BIT 1 OF HIGH REGISTER =
R0780                       (B IS A BLANK        1 UNIT OF XX
R0781                       POSITION. DECIMAL    BIT 1 OF LOW REGISTER =
R0782                       ONLY, DISPLAY OR     1 UNIT OF YY
R0783                       MONITOR ONLY. CANNOT (EACH REGISTER MUST
R0784                       BE LOADED.)          CONTAIN A POSITIVE INTEGER
R0785                       (MAX 99B99)           LESS THAN 100)

R0786   -LL-
R0787   VELOCITY/2VS        XXXXX. FEET/SEC   DP FRACTIONAL PART OF
R0788                       (MAX 51532.)         2VS FEET/SEC
R0789                                            (VS = 25766.1973)
```

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```
R0790   -VV-
R0791   POSITION8          XXXX.X NAUT MI      OP BIT 1 OF LOW REGISTER =
R0792                                                        -28
R0793                                          4 X 6,373,338 X 2
R0794                                          ------------------
R0795                                                1852
R0796                                          NAUT MI

R0797   -XX-
R0798   POSITION 9          XXX.XX NAUT MI      OP BIT 1 OF LOW REGISTER =
R0799                       (MAX 283.09)           -9
R0800                                          2    METERS

R0801   -YY-
R0802   VELOCITY 4          XXXX.X FEET/SEC     OP FRACTIONAL PART OF
R0803                       (MAX 328.0)            METERS/CENTI-SEC

R0804   THAT-S ALL ON THE NOUNS.
```

L ASSEMELY AND OPERATICN INFORMATION USER'S PAGE NO. 21 E0

R0805 ALARM CODES FOR 504

R0806 REPORT DEFICIENCIES TO JOHN SUTHERLAND @ MIT 617-864-6900 X1458

R0807	*9	*18	*60	*25 COLUMN
R0809	CODE	* TYPE	SET BY	ALARM ROUTINE
R0811	00110	NO MARK SINCE LAST MARK REJECT	SXTMARK	ALARM
R0813	00112	MARK NOT BEING ACCEPTED	SXTMARK	ALARM
R0815	00113	NO INBITS	SXTMARK	ALARM
R0817	00114	MARK MADE BUT NOT DESIRED	SXTMARK	ALARM
R0819	00115	OPTICS TORQUE REQUESTWITH SWITCH NOT AT	EXT VERB OPTICS CDU	ALARM
R0821		CGC		
R0822	00116	OPTICS SWITCH ALTERED BEFORE 15 SEC ZERO	T4RUPT	ALARM
R0824		TIME ELAPSED.		
R0825	00117	OPTICS TORQUE REQUEST WITH OPTICS NOT	EXT VERB OPTICS CDU	ALARM
R0827		AVAILABLE (OPTIND=-0)		
R0828	00120	OPTICS TORQUE REQUEST WITH OPTICS	T4RUPT	ALARM
R0830		NOT ZEROED		
R0831	00121	CDUS NO GOOD AT TIME OF MARK	SXTMARK	ALARM
R0833	00122	MARKING NOT CALLED FOR	SXTMARK	ALARM
R0835	00124	P17 TPI SEARCH - NO SAFE PERICTR HERE.	TPI SEARCH	ALARM
R0837	00205	BAD PIPA READING	SERVICER	ALARM
R0839	00206	ZERO ENCODE NOT ALLOWED WITH COARSE ALIGN	IMU MODE SWITCHING	ALARM
R0841		+ GIMBAL LOCK		
R0842	00207	ISS TURNON REQUEST NOT PRESENT FOR 90 SEC	T4RUPT	ALARM
R0844	00210	IMU NOT OPERATING	IMU MODE SWITCH, IMU-2, R02, P51	ALARM,VARALARM
R0846	00211	COARSE ALIGN ERROR - DRIVE > 2 DEGREES	IMU MODE SWITCH	ALARM
R0848	00212	PIPA FAIL BUT PIPA IS NOT BEING USED	IMU MODE SWITCH,T4RPT	ALARM
R0850	00213	IMU NOT OPERATING WITH TURN-ON REQUEST	T4RUPT	ALARM
R0852	00214	PROGRAM USING IMU WHEN TURNED OFF	T4RUPT	ALARM
R0854	00215	PREFERRED ORIENTATION NOT SPECIFIED	P52,P54	ALARM
R0856	00217	BAD RETURN FROM STALL ROUTINES.	CURTAINS	ALARM2
R0858	00220	IMU NOT ALIGNED - NO REFSMMAT	R02,P51	VARALARM
R0860	00401	DESIRED GIMBAL ANGLES YIELD GIMBAL LOCK	IMF ALIGN, IMU-2	ALARM
R0862	00404	TARGET OUT OF VIEW - TRUN ANGLE > 90 DEG	R52	PRIOLARM
R0864	00405	TWO STARS NOT AVAILABLE	P52,P54	ALARM
R0866	00406	REND NAVIGATION NOT OPERATING	R21,R23	ALARM
R0868	00407	AUTO OPTICS REQUEST TRUN ANGLE > 50 DEG.	R52	ALARM
R0870	00420	THIRD CALL TO ORBITAL INTEGRATION	ALL CALLS TO INTEG	?
R0872	00421	W-MATRIX OVERFLOW	INTEGRV	ALARM
R0874	00605	NUMBER OF ITERATIONS EXCEEDS LOOP MAXIMUM	P32,P72,	VARALARM
R0876	00611	NO TIG FOR GIVEN ELEV ANGLE	P34,P74	VARALARM
R0878	00612	STATE VECTOR IN WRONG SPHERE OF INFLUENCE	P37	VARALARM
R0880	00613	REENTRY ANGLE OUT OF LIMITS	P37	VARALARM
R0883	01103	* UNUSED CCS BRANCH EXECUTED	ABORT	ALARM2
R0885	01104	* DELAY ROUTINE BUSY	EXEC	BAILOUT
R0887	01105	DOWNLINK TOO FAST	T4RUPT	ALARM
R0889	01106	UPLINK TOO FAST	T4RUPT	ALARM

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R0891	01107	PHASE TABLE FAILURE. ASSUME	RESATRT	ALARM
R0893		ERASABLE MEMORY IS DESTROYED		
R0894	01201	* EXECUTIVE OVERFLOW-NO VAC AREAS	EXEC	BAILOUT
R0896	01202	* EXECUTIVE OVERFLOW-NO CORE SETS	EXEC	BAILOUT
R0898	01203	* WAITLIST OVERFLOW-TOO MANY TASKS	WAITLIST	BAILOUT
R0900	01206	* SECOND JOB ATTEMPTS TO GO TO SLEEP	PINBALL	POODOO
R0902		VIA KEYBOARD AND DISPLAY PROGRAM		
R0903	01207	* NO VAC AREA FOR MARKS	SXTMARK	BAILOUT
R0905	01210	* TWO PROGRAMS USING DEVICE AT SAME TIME	IMU MODE SWITCH	POODOO
R0907	01211	* ILLEGAL INTERRUPT OF EXTENDED VERB	SXTMARK	BAILOUT
R0909	01301	* ARCSIN-ARCCOS INPUT ANGLE TOO LARGE.ABORT	INTERPRETER	POODOO
R0911	01302	* SQRT CALLED WITH NEGATIVE ARGUMENT.ABORT	INTERPRETER	POODOO
R0913	01407	VG INCREASING	S40.8	ALARM
R0915	01426	IMU UNSATISFACTORY	P61, P62	ALARM
R0917	01427	IMU REVERSED	P61, P62	ALARM
R0919	01501	* KEYBOARD AND DISPLAY ALARM DURING	PINBALL	POODOO
R0921		INTERNAL USE (NVSUB). ABORT.		
R0922	01502	* ILLEGAL FLASHING DISPLAY	GOPLAY	POODOO
R0924	01520	V37 REQUEST NOT PERMITTED AT THIS TIME	V37	ALARM
R0926	01600	OVERFLOW IN DRIFT TEST	OPT PRE ALIGN CALIB	ALARM
R0928	01601	* BAD IMU TORQUE - ABORT	OPT PRE ALIGN CALIB	ALARM
R0930	01602	BAD OPTICS DURING VERIFICATION	OPTALGN CALIB (CSM)	ALARM
R0932	01703	INSUF. TIME FOR INTEG., TIG WAS SLIPPED	R41	ALARM
R0934	01706	STAGE VERIFY DISCRETE DOES NOT AGREE	R03	?
R0936	01707	CHECKLIST 203 NOT PERFORMED.	R61	?
R0938	03777	ICDU FAIL CAUSED THE ISS WARNING	T4RUPT	VARALARM
R0940	04777	ICDU , PIPA FAILS CAUSED THE ISS WARNING	T4RUPT	VARALARM
R0942	07777	IMU FAIL CAUSED THE ISS WARNING	T4RUPT	VARALARM
R0944	10777	IMU , PIPA FAILS CAUSED THE ISS WARNING	T4RUPT	VARALARM
R0946	13777	IMU , ICDU FAILS CAUSED THE ISS WARNING	T4RUPT	VARALARM
R0948	14777	IMU,ICDU,PIPA FAILS CAUSED THE ISSWNING	T4RUPT	VARALARM
R0950		* INDICATES ABORT TYPE.ALL OTHERS ARE NON-ABORTIVE		

```
P0951            CHECKLIST CODES FOR 504

R0952            PLEASE REPORT ANY DEFICIENCIES IN THIS LIST TO JOHN SUTHERLAND

R0953   *9      *17      *26  COLUMN

R0954   R1 CODE    ACTION TO BE EFFECTED

R0955   00014   KEY IN   FINE ALIGNMENT OPTION
R0956   00015   PERFORM  CELESTIAL BODY ACQUISITION
R0957   00016   KEY IN   TERMINATE MARK SEQUENCE
R0958   00041   SWITCH   CM/SM SEPARATION TO UP
R0959   00042   SWITCH   AGC POWER DOWN
R0960   00202   PERFORM  GNCS AUTOMATIC MANEUVER
R0961   00203   SWITCH   TO CMC-AUTO
R0962   00204   PERFORM  SPS GIMBAL TRIM
R0963   00403   SWITCH   OPTICS TO MANUAL OR ZERO
R0964                      SWITCH DENOTES CHANGE POSITION OF A CONSOLE SWITCH
R0965                      PERFORM DENOTES START OR END OF A TASK
R0966                      KEY IN DENOTES KEY IN OF DATA THRU THE DSKY
```

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P0967 OPTION CODES FOR 504

R0968 PLEASE REPORT ANY DEFICIENCIES IN THIS LIST TO JOHN SUTHERLAND

R0969 THE SPECIFIED OPTION CODES WILL BE FLASHED IN COMPONENT R1 IN
R0970 CONJUNCTION WITH VERB04NOUN06 TO REQUEST THE ASTRONAUT TO LOAD INTO
R0971 COMPONENT R2 THE OPTION HE DESIRES.

R0972 *9 *17 *52 *11 *25 COLUMN

R0974 OPTION
R0975 CODE PURPOSE INPUT FOR COMPONENT 2 PROGRAM(S) APPLICABILITY

R0977 00001 SPECIFY IMU ORIENTATION 1=PREF 2=NOM 3=REFSMMAT P50'S ALL
R0979 00002 SPECIFY VEHICLE 1=THIS 2=OTHER P21,R30 ALL
R0981 00003 SPECIFY TRACKING ATTITUDE 1=PREFERRED 2=OTHER R63 ALL
R0983 00004 SPECIFY RADAR 1=RR 2=LR R04 SUNDANCE + LUMINARY
R0985 00005 SPECIFY SCR PHASE 1=FIRST 2=SECOND P38 COLOSSUS + LUMINARY
R0987 00006 SPECIFY RR COARSE ALIGN OPTION 1=LOCKON 2=CONTINUOUS DESIG. V41N72 SUNDANCE + LUMINARY
R0989 00007 SPECIFY PROPULSION SYSTEM 1=SPS 2=RCS P37 COLOSSUS
R0991 00010 SPECIFY ALIGNMENT MODE 0=ANY TIME 1=REFSMMAT +G P57 LUMINARY
R0993 2=TWO BODIES 3=ONE BODY + G
R0994 00011 SPECIFY SEPARATION MONITOR PHASE 1=DELTAV 2=STATE VECTOR UPDATE P46 LUMINARY
R0996 00012 SPECIFY CSM ORBIT OPTION 1=NO ORBIT CHANGE 2=CHANGE P22 LUMINARY
R0998 ORBIT TO PASS OVER LM

```
0001                          44,2000  44,2000   FIXED    MEMORY 120000 - 167777
0002   REF   1                                            COUNT  BANKSUM

R00025          MODULE 1 CONTAINS BANKS 0 THROUGH 5

0003                          4000                        BLOCK  02
0004                          4000              FFTAG1    EQUALS
0005                          4000              FFTAG2    EQUALS
0006                          4000              FFTAG3    EQUALS
0007                          4000              FFTAG4    EQUALS
0008                          4000              FFTAG7    EQUALS
0009                          4000              FFTAG8    EQUALS
0010                          4000              FFTAG9    EQUALS
0011                          4000              FFTAG10   EQUALS
0012                          4000              FFTAG12   EQUALS
0013     77 WORDS LEFT        5662   05662 0              BNKSUM 02
0013                          5663   05663 1

0014                          6000                        BLOCK  03
0015                          6000              FFTAG5    EQUALS
0016                          6000              FFTAG6    EQUALS
0017     21 WORDS LEFT        7752   07752 0              BNKSUM 03
0017                          7753   07753 1

0018                          00,2000                     BANK   00
0019                          00,2000           DLAYJOB   EQUALS
0020     9 WORDS LEFT         00,3766  03766 0              BNKSUM 00
0020                          00,3767  03767 1

0021                          01,2000                     BANK   01
0022                          01,2000           RESTART   EQUALS
0023     7 WORDS LEFT         01,3770  03770 1              BNKSUM 01
0023                          01,3771  03771 0

0024                          04,2000                     BANK   4
0025                          04,2000           VERB37    EQUALS
0026                          04,2000           CONICS1   EQUALS
0027                          04,2000           PINBALL4  EQUALS
0028                          04,2000           R36LM     EQUALS
0029                          04,2000           INTPRET2  EQUALS
00291                         04,2000           IMUCAL1   EQUALS
00292                         04,2000           STBLEORB  EQUALS
00293                         04,2000           E/PROG    EQUALS
00294                         04,2000           MIDDGIM   EQUALS
0030     50 WORDS LEFT        04,3645  03645 0              BNKSUM 04
0030                          04,3646  03646 0
```

L TAGS FOR RELATIVE SETLOC AND BLANK BANK CARDS USER'S PAGE NO. 2 E0

```
0031                          05,2000                        BANK   5
0032                          05,2000              FRANDRES  EQUALS
0033                          05,2000              DOWNTELM  EQUALS
00335                         05,2000              DAPMASS   EQUALS
0034    121 WORDS LEFT        05,3606   03606 1             BNKSUM 05
0034                          05,3607   03607 0

R00345          MODULE 2 CONTAINS BANKS 6 THROUGH 13

0035                          06,2000                        BANK   6
0036                          06,2000              IMUCOMP   EQUALS
0037                          06,2000              T4RUP     EQUALS
00375                         06,2000              IMUCAL2   EQUALS
0038    86 WORDS LEFT         06,3651   03651 0             BNKSUM 06
0038                          06,3652   03652 0

0039                          07,2000                        BANK   7
0040                          07,2000              SXTMARKE  EQUALS
0041                          07,2000              R02       EQUALS
0042                          07,2000              MODESW    EQUALS
0043                          07,2000              XANG      EQUALS
0044                          07,2000              KEYRUPT   EQUALS
0045    48 WORDS LEFT         07,3717   03717 0             BNKSUM 07
0045                          07,3720   03720 1

0046                          10,2000                        BANK   10
0047                          10,2000              DISPLAYS  EQUALS
0048                          10,2000              PHASETAB  EQUALS
0049                          10,2000              COMGEOM2  EQUALS
0050                          10,2000              SXTMARK1  EQUALS
0051                          10,2000              P60S4     EQUALS
0052                          10,2000              OPTDRV    EQUALS
0053    61 WORDS LEFT         10,3702   03702 1             BNKSUM 10
0053                          10,3703   03703 0

0054                          11,2000                        BANK   11
0055                          11,2000              ORBITAL   EQUALS
0056                          11,2000              ORBITAL1  EQUALS          CONSTANTS
0057                          11,2000              INTVEL    EQUALS
0058                          11,2000              S52/2     EQUALS
0059    46 WORDS LEFT         11,3721   03721 0             BNKSUM 11
0059                          11,3722   03722 0

0060                          12,2000                        BANK   12
0061                          12,2000              CONICS    EQUALS
```

```
0062      34 WCRDS LEFT      12,3735   03735 C          BNKSUM 12
0062                         12,3736   03736 C

0063                         13,2000                    BANK   13
0064                         13,2000          P76LOC    EQUALS
0065                         13,2000          LATLONG   EQUALS
0066                         13,2000          INTINIT   EQUALS
0067                         13,2000          SR52/1    EQUALS
00675                        13,2000          ORBITAL2  EQUALS
0069       9 WCRDS LEFT      13,3766   03766 C          BNKSUM 13
0069                         13,3767   03767 1

R0070   SPACER

R00705              MCDULE 3 CONTAINS BANKS 14 THROUGH 21

0071                         14,2000                    BANK   14
0072                         14,2000          STARTAB   EQUALS
0073                         14,2000          RT53      EQUALS
0074                         14,2000          P50S1     EQUALS
0075      22 WCRDS LEFT      14,3751   03751 1          BNKSUM 14
0075                         14,3752   03752 1

0076                         15,2000                    BANK   15
0077                         15,2000          P50S      EQUALS
0078                         15,2000          ETRYDAP   EQUALS
0079                         15,2000          S52/3     EQUALS
0080      13 WCRDS LEFT      15,3762   03762 1          BNKSUM 15
0080                         15,3763   03763 C

0081                         16,2000                    BANK   16
0082                         16,2000          P40S1     EQUALS
0083                         16,2000          DAPROLL   EQUALS
0084                         16,2000          P50S2     EQUALS
0085      35 WCRDS LEFT      16,3734   03734 1          BNKSUM 16
0085                         16,3735   03735 C

0086                         17,2000                    BANK   17
0087                         17,2000          DAPS4     EQUALS
0088                         17,2000          DAPS5     EQUALS
0089                         17,2000          DAPS7     EQUALS
0090       9 WCRDS LEFT      17,3766   03766 C          BNKSUM 17
0090                         17,3767   03767 1

0091                         20,2000                    BANK   20
```

```
0092                          20,2000                DAPS6    EQUALS
0093                          20,2000                DAPS1    EQUALS
0094                          20,2000                DAPS2    EQUALS
0095     65 WORDS LEFT        20,3676   03676 0              BNKSUM 20
0095                          20,3677   03677 1

0096                          21,2000                         BANK   21
0097                          21,2000                DAPS3    EQUALS
0098                          21,2000                MYSUBS   EQUALS
0099     22 WORDS LEFT        21,3751   03751 1              BNKSUM 21
0099                          21,3752   03752 1

R00995          MODULE 4 CONTAINS BANKS 22 THROUGH 27

0100                          22,2000                         BANK   22
0101                          22,2000                RTBCODES EQUALS
0102                          22,2000                RTBCODE1 EQUALS
0103                          22,2000                DAPS8    EQUALS
0104                          22,2000                APOPERI  EQUALS
0105                          22,2000                P40S5    EQUALS
0106                          22,2000                KALCMON2 EQUALS
0107                          22,2000                KALCMON1 EQUALS
0108     5 WORDS LEFT         22,3772   03772 0              BNKSUM 22
0108                          22,3773   03773 1

0109                          23,2000                         BANK   23
0110                          23,2000                P20S2    EQUALS
0111                          23,2000                INFLIGHT EQUALS
0112                          23,2000                COMGEOM1 EQUALS
0113                          23,2000                POWFLITE EQUALS
0114                          23,2000                POWFLIT1 EQUALS
0115                          23,2000                RENDGUID EQUALS
0116                          23,2000                POWFLIT2 EQUALS
0117                          23,2000                R30LOC   EQUALS
0118                          23,2000                P11FOUR  EQUALS
0119     42 WORDS LEFT        23,3725   03725 1              BNKSUM 23
0119                          23,3726   03726 1

0120                          24,2000                         BANK   24
0121                          24,2000                LOADCAP  EQUALS
0122                          24,2000                P40S     EQUALS
0125     58 WORDS LEFT        24,3705   03705 0              BNKSUM 24
0125                          24,3706   03706 0

0126                          25,2000                         BANK   25
```

L TAGS FOR RELATIVE SETLOC AND BLANK BANK CARDS USER'S PAGE NO. 5 EO

```
0127                          25,2000            REENTRY  EQUALS
0128      9 WORDS LEFT        25,3766  03766 0            BNKSUM 25
0128                          25,3767  03767 1

0129                          26,2000                     BANK   26
0130                          26,2000            INTPRET1 EQUALS
0131                          26,2000            REENTRY1 EQUALS
0132                          26,2000            P60S     EQUALS
0133                          26,2000            P60S1    EQUALS
0134                          26,2000            P60S2    EQUALS
0135                          26,2000            P60S3    EQUALS
0136                          26,2000            PLANTIN  EQUALS                LUNAR ROT
0137                          26,2000            EPHEM    EQUALS
0138                          26,2000            P05P06   EQUALS
01381                         26,2000            26P50S   EQUALS
0139      3 WORDS LEFT        26,3774  03774 0            BNKSUM 26
0139                          26,3775  03775 1

R0140

0141                          27,2000                     BANK   27
0142                          27,2000            TOF-FF   EQUALS
0143                          27,2000            TOF-FF1  EQUALS
0144                          27,2000            MANUVER  EQUALS
0145                          27,2000            MANUVER1 EQUALS
0146                          27,2000            VECPT    EQUALS
0147                          27,2000            UPDATE1  EQUALS
0148                          27,2000            UPDATE2  EQUALS
0149                          27,2000            R22S1    EQUALS
01495                         27,2000            P60S5    EQUALS
0150      42 WORDS LEFT       27,3725  03725 1            BNKSUM 27
0150                          27,3726  03726 1

R01505          MODULE 5 CONTAINS BANKS 30 THROUGH 35

0151                          30,2000                     BANK   30
0152                          30,2000            IMUSUPER EQUALS
0153                          30,2000            LOWSUPER EQUALS
0154                          30,2000            FCSTART  EQUALS          STANDARD LOCATION FOR THIS.  (FOR EXTVB)
0155                          30,2000            LOPC     EQUALS
0156                          30,2000            P20S1    EQUALS
0157                          30,2000            P20S6    EQUALS
01575                         30,2000            P40S3    EQUALS
01577                         30,2000            R35A     EQUALS
0158      1 WORDS LEFT        30,3776  03776 1            BNKSUM 30

0159                          31,2000                     BANK   31
```

```
0160                          31,2000              R35      EQUALS
0161                          31,2000              RT23     EQUALS
0162                          31,2000              P30S1A   EQUALS
01621                         31,2000              R34      EQUALS
0163      9 WORDS LEFT        31,3766   03766 C             BNKSUM 31
0163                          31,3767   03767 1

0164                          32,2000                       BANK   32
0165                          32,2000              MSGSCAN1 EQUALS
0166                          32,2000              RTE      EQUALS
0167                          32,2000              DELRSPL1 EQUALS
01675                         32,2000              IMUCAL3  EQUALS
0168      1 WORDS LEFT        32,3776   03776 1             BNKSUM 32

0169                          33,2000                       BANK   33
0170                          33,2000              TESTLEAD EQUALS
0171                          33,2000              IMUCAL   EQUALS
0172      4 WORDS LEFT        33,3773   03773 1             BNKSUM 33
0172                          33,3774   03774 C
```

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L TAGS FOR RELATIVE SETLOC AND BLANK BANK CARDS USER'S PAGE NO. 6 E0

```
0173                          34,2000                       BANK   34
0175                          34,2000              P11ONE   EQUALS
0176                          34,2000              P20S3    EQUALS
0177                          34,2000              P20S4    EQUALS
01775                         34,2000              RTECON   EQUALS
0178      0 WORDS LEFT        34,2000   NO NEED             BNKSUM 34

0179                          35,2000                       BANK   35
01795                         35,2000              RTECON1  EQUALS
0180                          35,2000              CSI/CDH  EQUALS
0181                          35,2000              P30S1    EQUALS
0182                          35,2000              P30S     EQUALS
0183                          35,2000              R31      EQUALS
0184                          35,2000              P17S1    EQUALS
0185      4 WORDS LEFT        35,3773   03773 1             BNKSUM 35
0185                          35,3774   03774 C

R01855          MODULE 6 CONTAINS BANKS 36 THROUGH 43

0186                          36,2000                       BANK   36
0188                          36,2000              MEASINC  EQUALS
0189                          36,2000              MEASINC1 EQUALS
0190                          36,2000              P17S     EQUALS
0191                          36,2000              RTE1     EQUALS
0192      11 WORDS LEFT       36,3764   03764 1             BNKSUM 36
0192                          36,3765   03765 C
```

```
0193                          37,2000                    BANK   37
0194                          37,2000          P20S      EQUALS
0195                          37,2000          BODYATT   EQUALS
0196                          37,2000          RENDEZ    EQUALS
0197                          37,2000          SERVICES  EQUALS
01975                         37,2000          P11TWO    EQUALS
0198    63 WORDS LEFT         37,3700  03700 0           BNKSUM 37
0198                          37,3701  03701 1

0199                          40,2000                    BANK   40
0200                          40,2000          PINSUPER  EQUALS
0201                          40,2000          SELFSUPR  EQUALS
0202                          40,2000          PINBALL1  EQUALS
0203    35 WORDS LEFT         40,3734  03734 1           BNKSUM 40
0203                          40,3735  03735 0

0204                          41,2000                    BANK   41
0205                          41,2000          PINBALL2  EQUALS
0206    53 WORDS LEFT         41,3712  03712 0           BNKSUM 41
0206                          41,3713  03713 1

0207                          42,2000                    BANK   42
0208                          42,2000          SBAND     EQUALS
0209                          42,2000          PINBALL3  EQUALS
02095                         42,2000          EXTVBS    EQUALS
0210    58 WORDS LEFT         42,3705  03705 0           BNKSUM 42
0210                          42,3706  03706 0

0211                          43,2000                    BANK   43
0212                          43,2000          SELFCHEC  EQUALS
0213                          43,2000          EXTVERBS  EQUALS
0214    14 WORDS LEFT         43,3761  03761 1           BNKSUM 43
0214                          43,3762  03762 1

0215  REF  1                  26,3331          HI6ZEROS  EQUALS ZEROVECS      ZERO VECTOR ALWAYS IN HIGH MEMORY
0216  REF  1                  04,3452          LO6ZEROS  EQUALS ZEROVEC       ZERO VECTOR ALWAYS IN LOW MEMORY
0217  REF  1                  26,3327          HIDPHALF  EQUALS UNITX
0218  REF  1                  04,3450          LODPHALF  EQUALS XUNIT
0219  REF  1                  26,3321          HIDP1/4   EQUALS DP1/4TH
0220  REF  1                  04,3476          LODP1/4   EQUALS D1/4          2DEC .25
0221  REF  2  LAST  31        26,3327          HIUNITX   EQUALS UNITX
0222  REF  1                  26,3325          HIUNITY   EQUALS UNITY
0223  REF  1                  26,3323          HIUNITZ   EQUALS UNITZ
0224  REF  2  LAST  31        04,3450          LOUNITX   EQUALS XUNIT         2DEC .5
0225  REF  1                  04,3446          LOUNITY   EQUALS YUNIT         2DEC 0
```

L TAGS FOR RELATIVE SETLOC AND BLANK BANK CARDS USER'S PAGE NO. 8 EO

```
 0226   REF   1                 04,3444          LOUNITZ  EQUALS ZUNIT          2DEC 0
 0227   REF   1                 11,3706          3/4LOWDP EQUALS 3/4            2DEC 3.0 8-2
 0228   REF   1                 30,2000                   SBANK= LOWSUPER

R0229   ROPE SPECIFIC ASSIGNS OBVIATING NEED TO CHECK COMPUTER FLAG IN DETVRUZVING INTEGRATION AREA ENTRIES
 0231   REF   1                 13,3036          OTHPREC  EQUALS LEMPREC
 0232   REF   1                 13,2711          ATOPOTH  EQUALS ATOPLEM
 0233   REF   1                 13,2636          ATOPTHIS EQUALS ATOPCSM
 0234   REF   1                    0173          MOONTHIS EQUALS CMOONFLG
 02345  REF   1                    0174          MOONOTH  EQUALS LMOONFLG
 0235   REF   1                 13,2651          MOVATHIS EQUALS MOVEACSM
 0236   REF   1                 35,3204          STATEST  EQUALS V83CALL        * TEMPORARY
 0237   REF   1                 13,3022          THISPREC EQUALS CSMPREC
 0238   REF   3 LAST   31       26,3327          THISAXIS =      UNITX
 02385  REF   1                    4747          ERASID   EQUALS LOW10          DOWNLINK ERASABLE DUMP ID
 02388  REF   1                    6214          DELAYNUM EQUALS THREE
R0239   ********************************************************************************************************

R0241      THE FOLLOWING ECADRS ARE DEFINED TO FACILITATE EBANK SWITCHING. THEY ALSO MAKE IT EASIER FOR
R0243   ERASABLE CONTROL TO REARRANGE ERASABLE MEMORY WITHOUT DISRUPTING THE PROGRAMS WHICH SET EBANKS.
R0245   PRIOR TO ROPE RELEASE FIXED MEMORY CAN BE SAVED BY SETTING EACH EBXXXX =EBANKX (X=4,5,6,7).EBANKX OF COURSE
R0247   WILL BE THE BANK WHERE THE ERASABLES REFERENCED IN EBXXXX WILL BE STORED.

 0249                           07,2000                             BANK   7
 0250   REF   1                 E7,1674                             EBANK= MARKDOWN
 0251   REF   2 LAST   32       07,2000          03674 1  EBMARKDO ECADR  MARKDOWN
 0252   REF   1                 E7,1725                             EBANK= MRKBUF1
 0253   REF   2 LAST   32       07,2001          03725 1  EBMRKBUF ECADR  MRKBUF1

 0254                           24,2000                             BANK   24
 0255   REF   1                 E7,1431                             EBANK= DVCNTR
 0256   REF   2 LAST   32       24,2000          03431 1  EBDVCNTR ECADR  DVCNTR
 0257   REF   1                 E7,1672                             EBANK= P40TMP
 0258   REF   2 LAST   32       24,2001          03672 1  EBP40TMP ECADR  P40TMP

 0259                           34,2000                             BANK   34
 0260   REF   3 LAST   32       E7,1431                             EBANK= DVCNTR
 0261   REF   4 LAST   32       34,2000          03431 1  EBDVCNT  ECADR  DVCNTR
 0262   REF   1                 E5,1426                             EBANK= QPLACES
 0263   REF   2 LAST   32       34,2001          02426 0  EBQPLACE ECADR  QPLACES

 0264                           37,2000                             BANK   37
 0265   REF   1                    1231                             EBANK= RN1
 0266   REF   2 LAST   32       37,2000          01231 0  EBRN1    ECADR  RN1

R0267   ********************************************************************************************************
```

L SUBROUTINE CALLS USER'S PAGE NO. 1 EQ S3

0001	37,2000	SUBRO	KILERASE
0002	37,2000	SUBRO	KOOLADE
0003	37,2000	SUBRO	SMOOCH
0004	37,2000	SUBRO	PANDORA
0005	37,2000	SUBRO	DAPCSM
0006	37,2000	SUBRO	SATRAP

*** END OF MAIN PROGRAM ***

```
R0001   CONVENTIONS AND NOTATIONS UTILIZED FOR ERASABLE ASSIGNMENTS.

R0002           EQUALS IS USED IN TWO WAYS.  IT IS OFTEN USED TO CHAIN A GROUP
R0003                   OF ASSIGNMENTS SO THAT THE GROUP MAY BE MOVED WITH THE
R0004                   CHANGING OF ONLY ONE CARD.  EXAMPLE.

A0005                                   X       EQUALS START
A0006                                   Y       EQUALS X        +SIZE.X
A0007                                   Z       EQUALS Y        +SIZE.Y

R0008                   (X, Y, AND Z ARE CONSECUTIVE AND BEGIN AT START.        )
R0009                   (SIZE.X AND SIZE.Y ARE THE RESPECTIVE SIZES OF X AND Y,
R0010                    USUALLY NUMERIC,  IE. 1, 2, 6, 18D ETC.                )


R0011           EQUALS OFTEN IMPLIES THE SHARING OF REGISTERS (DIFFERENT NAMES
R0012                   AND DIFFERENT DATA).  EXAMPLE.

A0013                                   X       EQUALS Y


R0014           = MEANS THAT MULTIPLE NAMES HAVE BEEN GIVEN TO THE SAME DATA.
R0015                   (THIS IS LOGICAL EQUIVALENCE, NOT SHARING)  EXAMPLE.

A0016                                   X       =       Y


R0017           THE SIZE AND UTILIZATION OF AN ERASABLE ARE OFTEN INCLUDED IN
R0018           THE COMMENTS IN THE FOLLOWING FORM.  M(SIZE)N.

R0019                   M REFERS TO THE MOBILITY OF THE ASSIGNMENT.
R0020                       B   MEANS THAT THE SYMBOL IS REFERENCED BY BASIC
R0021                           INSTRUCTIONS AND THUS IS E-BANK SENSITIVE.
R0022                       I   MEANS THAT THE SYMBOL IS REFERENCED ONLY BY
R0023                           INTERPRETIVE INSTRUCTIONS, AND IS THUS E-BANK
R0024                           INSENSITIVE AND MAY APPEAR IN ANY E-BANK.

R0025                   SIZE IS THE NUMBER OF REGISTERS INCLUDED BY THE SYMBOL.

R0026                   N INDICATES THE NATURE OR PERMANENCE OF THE CONTENTS.
R0027                       PL MEANS THAT THE CONTENTS ARE PAD LOADED.
R0028                       DSP MEANS THAT THE REGISTER IS USED FOR A DISPLAY.
R0029                       PRM MEANS THAT THE REGISTER IS PERMANENT, IE. IT
R0030                           IS USED DURING THE ENTIRE MISSION FOR ONE
R0031                           PURPOSE AND CANNOT BE SHARED.
R0032                       TMP MEANS THAT THE REGISTER IS USED TEMPORARILY OR
R0033                           IS A SCRATCH REGISTER FOR THE ROUTINE TO WHICH
R0034                           IT IS ASSIGNED.  THAT IS, IT NEED NOT BE SET
R0035                           PRIOR TO INVOCATION OF THE ROUTINE NOR DOES IT
R0036                           CONTAIN USEFUL OUTPUT TO ANOTHER ROUTINE.  THUS
```

```
R0037                       IT MAY BE SHARED WITH ANY OTHER ROUTINE WHICH
R0038                       IS NOT ACTIVE IN PARALLEL.
R0039                  IN   MEANS INPUT TO THE ROUTINE AND IT IS PROBABLY
R0040                       TEMPORARY FOR A HIGHER-LEVEL ROUTINE/PROGRAM.
R0041                  OUT  MEANS OUTPUT FROM THE ROUTINE, PROBABLY
R0042                       TEMPORARY FOR A HIGHER-LEVEL ROUTINE/PROGRAM.
```

```
P0050            SPECIAL REGISTERS.

 0051                0000    A         EQUALS 0
 0052                0001    L         EQUALS 1          L AND Q ARE BOTH CHANNELS AND REGISTERS.
 0053                0002    Q         EQUALS 2
 0054                0003    EBANK     EQUALS 3
 0055                0004    FBANK     EQUALS 4
 0056                0005    Z         EQUALS 5          ADJACENT TO FBANK AND BBANK FOR DXCH Z
 0057                0006    BBANK     EQUALS 6          (DTCB) AND CXCH FBANK (DTCF).
A0058                                                    REGISTER 7 IS A ZERO-SOURCE, USED BY ZL.

 0059                0010    ARUPT     EQUALS 10         INTERRUPT STORAGE.
 0060                0011    LRUPT     EQUALS 11
 0061                0012    QRUPT     EQUALS 12
 0062                0013    SAMPTIME  EQUALS 13         SAMPLED TIME 1 & 2.
 0063                0015    ZRUPT     EQUALS 15         (13 AND 14 ARE SPARES.)
 0064                0016    BANKRUPT  EQUALS 16         USUALLY HOLDS FBANK OR BBANK.
 0065                0017    BRUPT     EQUALS 17         RESUME ADDRESS AS WELL.

 0066                0020    CYR       EQUALS 20
 0067                0021    SR        EQUALS 21
 0068                0022    CYL       EQUALS 22
 0069                0023    EDOP      EQUALS 23         EDITS INTERPRETIVE OPERATION CODE PAIRS.

 0070                0024    TIME2     EQUALS 24
 0071                0025    TIME1     EQUALS 25
 0072                0026    TIME3     EQUALS 26
 0073                0027    TIME4     EQUALS 27
 0074                0030    TIME5     EQUALS 30
 0075                0031    TIME6     EQUALS 31
 0076                0032    CDUX      EQUALS 32
 0077                0033    CDUY      EQUALS 33
 0078                0034    CDUZ      EQUALS 34
 0079                0035    CDUT      EQUALS 35         OPTICS TRUNNION CDU (WAS OPTY).
 0080  REF    1      0035    OPTY      =      CDUT
 0081                0036    CDUS      EQUALS 36         OPTICS SHAFT CDU (WAS OPTX).
 0082  REF    1      0036    OPTX      =      CDUS
 0083                0037    PIPAX     EQUALS 37
 0084                0040    PIPAY     EQUALS 40
 0085                0041    PIPAZ     EQUALS 41
 0086                0042    BMAGX     EQUALS 42
 0087                0043    BMAGY     EQUALS 43
 0088                0044    BMAGZ     EQUALS 44
 0089                0045    INLINK    EQUALS 45
 0090                0046    RNRAD     EQUALS 46
 0091                0047    GYROCTR   EQUALS 47
 0092                0047    GYROCMD   EQUALS 47
 0093                0050    CDUXCMD   EQUALS 50
 0094                0051    CDUYCMD   EQUALS 51
```

L ERASABLE ASSIGNMENTS

```
0095                        0052    CDUZCMD  EQUALS 52
0096                        0053    CDUTCMD  EQUALS 53          OPTICS TRUNNION COMMAND (WAS OPTYCMD).
0097  REF   1               0053    OPTYCMD  =      CDUTCMD
0098  REF   2  LAST   37    0053    TVCYAW   EQUALS CDUTCMD      SPS YAW COMMAND IN TVC MODE.
0099                        0054    CDUSCMD  EQUALS 54          OPTICS SHAFT COMMAND (WAS OPTXCMD).
0100  REF   1               0054    TVCPITCH EQUALS CDUSCMD     SPS PITCH COMMAND IN TVC MODE.
0101  REF   2  LAST   37    0054    OPTXCMD  =      CDUSCMD
0102                        0055    EMSD     EQUALS 55
0103                        0055    THRUST   EQUALS 55
0104                        0056    LEMONM   EQUALS 56
0105                        0057    OUTLINK  EQUALS 57
0106                        0060    ALTM     EQUALS 60

R0107          INTERPRETIVE REGISTERS ADDRESSED RELATIVE TO VAC AREA.

0108                        0042    LVSQUARE EQUALS 34D         SQUARE OF VECTOR INPUT TO ABVAL AND UNIT
0109                        0044    LV       EQUALS 36D         LENGTH OF VECTOR INPUT TO UNIT.
0110                        0046    X1       EQUALS 38D         INTERPRETIVE SPECIAL REGISTERS RELATIVE
0111                        0047    X2       EQUALS 39D         TO THE WORK AREA.
0112                        0050    S1       EQUALS 40D
0113                        0051    S2       EQUALS 41D
0114                        0052    QPRET    EQUALS 42D
```

P0115 INPLT/OUTPUT CHANNELS

```
A01151                                  *** CHANNEL ZERO IS TO BE USED IN AN INDEXED OPERATION ONLY. ***
 01152  REF   1            0001        LCHAN     EQUALS L
 01153  REF   1            0002        QCHAN     EQUALS Q
 0116                      0003        HISCALAR  EQUALS 3
 0117                      0004        LOSCALAR  EQUALS 4
 0118                      0005        PYJETS    EQUALS 5
 0119                      0006        ROLLJETS  EQUALS 6
 0120                      0007        SUPERBNK  EQUALS 7
 0121                      0010        OUTO      EQUALS 10
 0122                      0011        DSALMOUT  EQUALS 11
 0123                      0012        CHAN12    EQUALS 12
 0124                      0013        CHAN13    EQUALS 13
 0125                      0014        CHAN14    EQUALS 14
 0126                      0015        MNKEYIN   EQUALS 15
 0127                      0016        NAVKEYIN  EQUALS 16
 01271                     0030        CHAN30    EQUALS 30
 01272                     0031        CHAN31    EQUALS 31
 01273                     0032        CHAN32    EQUALS 32
 0128                      0033        CHAN33    EQUALS 33
 0129                      0034        DNTM1     EQUALS 34
 0130                      0035        DNTM2     EQUALS 35
R0131  END OF CHANNEL ASSIGNMENTS
```

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P0135               FLAGWORDS

R0136   FLAGWRD0          STATE +0          (000-014)
R0137   FLAGWRD1          STATE +1          (015-029)
R0138   FLAGWRD2          STATE +2          (030-044)
R0139   FLAGWRD3          STATE +3          (045-059)
R0140   FLAGWRD4          STATE +4          (060-074)
R0141   FLAGWRD5          STATE +5          (075-089)
R0142   FLAGWRD6          STATE +6          (090-104)
R0143   FLAGWRD7          STATE +7          (105-119)
R0144   FLAGWRD8          STATE +8D         (120-134)
R0145   FLAGWRD9          STATE +9D         (135-149)
A0146

R0147               SORTED LIST OF

R0148               INTERPRITIVE SWITCH BIT ASSIGNMENTS

R0149   INTERPRETIVE SWITCH BIT ASSIGNMENTS
R0150   FLAGWORD        DEC NUM           BIT + FLAG          EQUIVALENT FLAGWORDS

R0151   22DSPFLG        0320              BIT 13 FLAG 2
R0152   36DSW           1340              BIT 1 FLAG 8
R0153   3AXISFLG        0840              BIT 6 FLAG 5
R0156   ADVTRK          1250              BIT 10 FLAG 8
R0157   APSESW          1300              BIT 5 FLAG 8
R0159   ASTNFLAG        1080              BIT 12 FLAG 7
R0161   ATTCHFLG        1180              BIT 2 FLAG 7
R0164   AVEGFLAG        0290              BIT 1 FLAG 1
R0165   AVEMIDSW        1490              BIT 1 FLAG 9
R0166   AVFLAG          0400              BIT 5 FLAG 2
R0169   CALCMAN2        0430              BIT 2 FLAG 2
R0170   CALCMAN3        0420              BIT 3 FLAG 2
R0171   CMDAPARM        0530              BIT 12 FLAG 6
R0172   CMDCNFLG        1230              BIT 12 FLAG 8
R0173   CM/DSTBY        1030              BIT 2 FLAG 6
R0174   DDGAFLAG        1310              BIT 4 FLAG 8
R0175   DDMPUTER        0820              BIT 8 FLAG 5
R0176   DPHIFLAG        0000              BIT 15 FLAG 0
R0177   DULTFLAG        0530              BIT 7 FLAG 3
R0178   DYCLESW         0350              BIT 10 FLAG 2
R0179   D6DR9FLG        0580              BIT 2 FLAG 3
R0180   DAPBIT1         0900              BIT 15 FLAG 6
R0181   DAPBIT2         0910              BIT 14 FLAG 6
R0182   DINCFLAG        0590              BIT 1 FLAG 3
R0184   DMENFLG         0810              BIT 9 FLAG 5
R0185   DRIFTFLG        0300              BIT 15 FLAG 2
R0186   DSKYFLAG        0750              BIT 15 FLAG 5
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R0187	EGSW	97D	BIT 8 FLAG 6	KNOWNFLG R57FLAG
R0189	ENG1FLAG	018D	BIT 12 FLAG 1	
R0190	ENG2FLAG	019D	BIT 11 FLAG 1	
R0191	ENGCNFLG	083D	BIT 7 FLAG 5	
R0193	ERADFLAG	017D	BIT 13 FLAG 1	
R0194	ETPIFLAG	038D	BIT 7 FLAG 2	FIRSTFLG OPTNSW
R0196	F2RTE	10D	BIT 5 FLAG 0	
R0197	FINALFLG	039D	BIT 6 FLAG 2	
R0198	FIRSTFLG	38D	BIT 7 FLAG 2	ETPIFLAG OPTNSW
R0201	FREEFLAG	012D	BIT 3 FLAG 0	
R0202	GAMDIFSW	094D	BIT 11 FLAG 6	
R0204	GLOKFAIL	046D	BIT 14 FLAG 3	
R0205	GMBDRVSW	095D	BIT 10 FLAG 6	GONEPAST
R0207	GONEBY	112D	BIT 8 FLAG 7	
R0208	GONEPAST	095D	BIT 10 FLAG 6	GMBDRVSW
R0209	GRRBKFLG	085D	BIT 5 FLAG 5	
R0211	GUESSW	028D	BIT 2 FLAG 1	
R0212	GYMDIFSW	104D	BIT 1 FLAG 6	
R0213	.05GSW	102D	BIT 3 FLAG 6	
R0214	HIND	099D	BIT 6 FLAG 6	
R02152	IDLEFAIL	024D	BIT 6 FLAG 1	
R0216	IDLEFLAG	113D	BIT 7 FLAG 7	
R0217	IGNFLAG	107D	BIT 13 FLAG 7	
R0218	INHULSW	036D	BIT 9 FLAG 2	
R0219	INLSE	0C7D	BIT 8 FLAG 0	
R0220	INCORFLG	079D	BIT 11 FLAG 5	
R0221	INFINFLG	128D	BIT 7 FLAG 8	
R0222	INRLSW	100D	BIT 5 FLAG 6	
R02221	INTFLAG	151D	BIT 14 FLAG 10	
R0225	INTYPFLG	056D	BIT 4 FLAG 3	
R0227	ITSWICH	106D	BIT 14 FLAG 7	
R0229	KFLAG	014D	BIT 1 FLAG 0	
R0232	KNOWNFLG	097D	BIT 8 FLAG 6	EGSW R57FLAG
R0234	LATSW	101D	BIT 4 FLAG 6	
R0235	LMCONFLG	124D	BIT 11 FLAG 8	
R0238	LUNAFLAG	048D	BIT 12 FLAG 3	
R02395	MAXQBFLG	138D	BIT 12 FLAG 9	
R0240	MGLVFLAG	088D	BIT 2 FLAG 5	
R0241	MID1FLAG	147D	BIT 3 FLAG 9	
R0242	MIDAVFLG	148D	BIT 2 FLAG 9	
R0243	MIDFLAG	002D	BIT 13 FLAG 0	
R0244	MKCVFLAG	072D	BIT 3 FLAG 4	
R0245	MOONFLAG	003D	BIT 12 FLAG 0	
R0246	MRKIDFLG	060D	BIT 15 FLAG 4	
R0247	MRKNVFLG	066D	BIT 9 FLAG 4	
R0248	MRLPTFLG	070D	BIT 5 FLAG 4	
R0251	MWAITFLG	064D	BIT 11 FLAG 4	
R0252	N22CRN17	144D	BIT 6 FLAG 9	
R0254	NEEDLFLG	0C6D	BIT 9 FLAG 0	
R0255	NEWIFLG	122D	BIT 13 FLAG 8	

L ERASABLE ASSIGNMENTS

R0256	NJETSFLG	015D	BIT 15 FLAG 1	
R0258	NODOFLAG	044D	BIT 1 FLAG 2	
R0259	NOREHCR	004D	BIT 11 FLAG 0	
R0260	NOREMSW	110D	BIT 10 FLAG 7	
R0261	NOSWITCH	098D	BIT 7 FLAG 6	
R0265	NRMIDFLG	062D	BIT 13 FLAG 4	
R0266	NRMNVFLG	067D	BIT 8 FLAG 4	
R0267	NRLPTFLG	071D	BIT 4 FLAG 4	
R0268	NTARGFLG	102D	BIT 3 FLAG 6	
R0269	NWAITFLG	065D	BIT 10 FLAG 4	
R0272	OPTNSW	038D	BIT 7 FLAG 2	ETPIFLAG FIRSTFLG
R0274	OREWFLAG	054D	BIT 6 FLAG 3	
R0275	ORDERSW	129D	BIT 6 FLAG 8	
R02765	P22MKFLG	45D	BIT 11 FLAG 3	
R0278	P35/75SW	126D	BIT 9 FLAG 8	
R0279	PCSPFLAG	063D	BIT 12 FLAG 4	
R0280	PFRATFLG	041D	BIT 4 FLAG 2	
R0281	PINBRFLG	069D	BIT 6 FLAG 4	
R0282	PRECIFLG	052D	BIT 8 FLAG 3	
R0283	PRFTRKAT	080D	BIT 10 FLAG 5	
R0284	PRIODFLG	061D	BIT 14 FLAG 4	
R0285	PRONVFLG	068D	BIT 7 FLAG 4	
R0286	QUITFLAG	145D	BIT 5 FLAG 9	
R0287	R21MARK	031D	BIT 14 FLAG 2	
R0288	R22CAFLG	143D	BIT 7 FLAG 9	
R0290	R23FLG	021D	BIT 9 FLAG 1	
R0291	R31FLAG	146D	BIT 4 FLAG 9	
R0293	R53FLAG	009D	BIT 6 FLAG 0	
R0294	R57FLAG	097D	BIT 8 FLAG 6	KNOWNFLG EGSW
R0296	R60FLAG	086D	BIT 4 FLAG 5	
R0297	REFSMFLG	047D	BIT 13 FLAG 3	
R02971	REINTFLG	158D	BIT 7 FLAG 10	
R0298	RELVELSW	096D	BIT 9 FLAG 6	
R0299	RENDWFLG	089D	BIT 1 FLAG 5	
R0300	RNDVZFLG	008D	BIT 7 FLAG 0	
R0304	RPCFLAG	120D	BIT 15 FLAG 8	
R0308	RVSW	111D	BIT 9 FLAG 7	
R0313	SAVECFLG	140D	BIT 10 FLAG 9	
R0314	SLOPESW	027D	BIT 3 FLAG 1	
R0315	SOLNSW	087D	BIT 3 FLAG 5	
R0316	SOURCFLG	142D	BIT 8 FLAG 9	
R0318	STATEFLG	055D	BIT 5 FLAG 3	
R0319	STEERSW	034D	BIT 11 FLAG 2	
R0320	STIKFLAG	016D	BIT 14 FLAG 1	
R03201	STRULLSW	92D	BIT 13 FLAG 6	
R0321	SURFFLAG	127D	BIT 8 FLAG 8	
R0323	SWTOVER	135D	BIT 15 FLAG 9	
R0324	TARG1FLG	020D	BIT 10 FLAG 1	
R0325	TARG2FLG	021D	BIT 9 FLAG 1	
R0326	TERMIFLG	105D	BIT 15 FLAG 7	

L ERASABLE ASSIGNMENTS

R0327	TFFSW	119D	BIT 1 FLAG 7
R0328	TINRFLAG	109D	BIT 11 FLAG 7
R0329	TRACKFLG	025D	BIT 5 FLAG 1
R03295	TRNG3FLG	26D	BIT 4 FLAG 1
R0330	TRUNFLAG	011D	BIT 4 FLAG 0
R0332	UPDATFLG	023D	BIT 7 FLAG 1
R0334	UPLOCKFL	116D	BIT 4 FLAG 7
R0335	V37FLAG	114D	BIT 6 FLAG 7
R0336	V59FLAG	078D	BIT 12 FLAG 5
R03361	V67FLAG	136D	BIT 14 FLAG 9
R03362	V82ENFLG	137D	BIT 13 FLAG 9
R0337	V94FLAG	139D	BIT 11 FLAG 9
R0338	VEHUPFLG	022D	BIT 8 FLAG 1
R0339	VERIFLAG	117D	BIT 3 FLAG 7
R0340	VFLAG	050D	BIT 10 FLAG 3
R0341	VHFRFLAG	141D	BIT 9 FLAG 9
R0343	VINTFLAG	057D	BIT 3 FLAG 3
R0344	XDELVFLG	037D	BIT 8 FLAG 2
R0345	XDSPFLAG	074D	BIT 1 FLAG 4

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P0352   INTERPRETIVE SWITCH BIT ASSIGNMENTS
 0353   REF   1                0074          FLAGWRD0 =      STATE +0        (000-014)

A0354                                                                       (SET)                 (RESET)

A0355                                                       BIT 15 FLAG 0
 0356                          0000          CPHIFLAG =      000D            OUTPUT OF CALCGA IS   OUTPUT OF CALCGA IS
A0357                                                                       CPHIX                 THETAD

 03575  REF   1                4674          CPHIBIT  =      BIT15

A0358                                                       BIT 14 FLAG 0
 0359                          0001          JSWITCH  =      001D            INTEGRATION OF W      INTEGRATION OF STATE
A0360                                                                       MATRIX                VECTOR

 03605  REF   1                4675          JSWCHBIT =      BIT14

A0361                                                       BIT 13 FLAG 0
 0362                          0002          MIDFLAG  =      002D            INTEGRATION WITH      INTEGRATION WITHOUT
A0363                                                                       SOLAR PERTURBATIONS   SOLAR PERTURBATIONS

 03635  REF   1                4676          MIDFLBIT =      BIT13

A0364                                                       BIT 12 FLAG 0
 0365                          0003          MOONFLAG =      003D            MOON IS SPHERE OF     EARTH IS SPHERE OF
A0366                                                                       INFLUENCE             INFLUENCE

 03665  REF   1                4677          MOONBIT  =      BIT12

A0369                                                       BIT 11 FLAG 0
 0370                          0004          NORFHOR  =      004D            FAR HORIZON           NEAR HORIZON


 03705  REF   1                4700          NORFBIT  =      BIT11

A0373                                                       BIT 10 FLAG 0
 0374                          0005          ZMEASURE =      005D            MEASUREMENT PLANET    MEASUREMENT PLANET
A0375                                                                       AND PRIMARY PLANET    AND PRIMARY PLANET
A0376                                                                       DIFFERENT             SAME

 03775  REF   1                4701          ZMEASBIT =      BIT10

A0379                                                       BIT 9 FLAG 0
 0380                          0006          NEEDLFLG =      006D            TOTAL ATTIDUDE        A/P FOLLOWING ERROR
A0381                                                                       ERROR DISPLAYED       DISPLAYED

 03815  REF   1                4702          NEEDLBIT =      BIT9

A0382                                                       BIT 8 FLAG 0
 0383                          0007          IMUSE    =      007D            IMU IN USE            IMU NOT IN USE
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03835  REF   1                4703          IMUSEBIT =      BIT8

                                                 BIT 7 FLAG 0
A0384
 0385                          0010          RNDVZFLG =      0008D       P20 RUNNING          P20 NOT RUNNING
 03865  REF   1                4704          RNDVZBIT =      BIT7

                                                 BIT 6 FLAG 0
A0390
 0391                          0011          R53FLAG  =      009D        V51 INITIATED        V51 NOT INITIATED


 03915  REF   1                4705          R53FLBIT =      BIT6

                                                 BIT 5 FLAG 0
A0395
 0396                          0012          F2RTE    =      010D        IN TIME CRITICAL     NOT IN TIME CRITICAL
A0397                                                                    MODE                 MODE

 03975  REF   1                4706          F2RTEBIT =      BIT5

                                                 BIT 4 FLAG 0
A0398
 0399                          0013          TRUNFLAG =      011D        DRIVING OF TRUNNION  DRIVING OF TRUNNION
A0400                                                                   ALLOWED              NOT ALLOWED

 04005  REF   1                4707          TRUNBIT  =      BIT4

                                                 BIT 3 FLAG 0
A0403
 0404                          0014          FREEFLAG =      012D        (TEMPORARY FLAG USED IN MANY ROUTINES)

 04045  REF   1                4710          FREEFBIT =      BIT3

                                                 BIT 2 FLAG 0
A0405
A0406                                      =      013D

                                                 BIT 1 FLAG 0
A0408
 0409                          0016          KFLAG    =      014D        SEARCH SECTOR MORE   SEARCH SECTOR LESS
A0410                                                                   THAN 180 DEGREES     THAN 180 DEGREES

 04105  REF   1                4712          KBIT     =      BIT1

 0411   REF   2  LAST  43      0075          FLAGWRD1 =      STATE +1    (015-029)

A0412                                                                   (SET)                (RESET)

                                                 BIT 15 FLAG 1
A0413
 0414                          0017          NJETSFLG =      015D        TWO JET RCS BURN     FOUR JET RCS BURN

 04145  REF   2  LAST  43      4674          NJETSBIT =      BIT15

                                                 BIT 14 FLAG 1
A0415
 0416                          0020          STIKFLAG =      016D        RHC CONTROL          CMC CONTROL
```

```
 04165  REF   2  LAST   43      4675          STIKBIT  =      BIT14

A0417                                                      BIT 13 FLAG 1
 0418                          0021          ERADFLAG =      017D          EARTH, COMPUTE       EARTH, USE FIXED
A0419                                                                      FISCHER ELLIPSOID    RADIUS
A04191                                                                     RADIUS
A04192                                                                     MOON, USE FIXED      MOON, USE RLS FOR
A04193                                                                          RADIUS               LUNAR RADIUS

 04195  REF   2  LAST   43      4676          ERADFBIT =      BIT13

A0420                                                      BIT 12 FLAG 1
A0421                                                 =    018D

A0422                                                      BIT 11 FLAG 1
 0423                          0023          ENG2FLAG =      019D          RCS BURN             SPS BURN

 04235  REF   2  LAST   43      4700          ENG2BIT  =      BIT11

A0427                                                      BIT 10 FLAG 1
 0428                          0024          TARG1FLG =      020D          SIGHTING LEM         NOT SIGHTING LEM

 04285  REF   2  LAST   43      4701          TARG1BIT =      BIT10

A0429                                                      BIT 9 FLAG 1
C430                           0025          TARG2FLG =      021D          SIGHTING LANDMARK    SIGHTING STAR

 04305  REF   2  LAST   43      4702          TARG2BIT =      BIT9

A0431                                                      BIT  9 FLAG 1
 0432                          0025          R23FLG   =      021D          R23 MARKING          R21 MARKING
A0433

 04335  REF   3  LAST   45      4702          R23BIT   =      BIT9

A0434                                                      BIT 8 FLAG 1
 0435                          0026          VEHUPFLG =      022D          CSM STATE VECTOR     LEM STATE VECTOR
A0436                                                                      BEING UPDATED        BEING UPDATED

 04365  REF   2  LAST   44      4703          VEHUPBIT =      BIT8

A0437                                                      BIT 7 FLAG 1
 0438                          0027          UPDATFLG =      023D          UPDATING BY MARKS    UPDATING BY MARKS
A0439                                                                      ALLOWED              NOT ALLOWED

 04395  REF   2  LAST   44      4704          UPDATBIT =      BIT7

A0440                                                      BIT 6 FLAG 1
```

04411		0030	IDLEFAIL =	024D	INHIBIT R41	ENABLE R41 (ENGFAIL)
04415	REF 2 LAST 44	4705	IDLEBIT =	BIT6		
A0442				BIT 5 FLAG 1		
0443		0031	TRACKFLG =	025D	TRACKING ALLOWED	TRACKING NOT ALLOWED
04435	REF 2 LAST 44	4706	TRACKBIT =	BIT5		
A0444				BIT 4 FLAG 1		
0445		0032	TRM03FLG =	26D	REQUEST TO	NO REQUEST TO
0446	REF 2 LAST 44	4707	TRM03BIT =	BIT4	TERMINATE P03 HAS	TERMINATE P03 HAS
A0447					BEEN ENTERED	BEEN ENTERED
A0450				BIT 3 FLAG 1		
0451		0033	SLOPESW =	27D	ITERATE WITH BIAS	ITERATE WITH REGULA
A0452					METHOD IN ITERATOR	FALSI METHOD IN
A04521						ITERATOR
04525	REF 2 LAST 44	4710	SLOPEBIT =	BIT3		
A0456				BIT 2 FLAG 1		
0457		0034	GUESSW =	028D	NO STARTING VALUE	STARTING VALUE FOR
A0458					FOR ITERATION	ITERATION EXISTS
04585	REF 1	4711	GUESSBIT =	BIT2		
A0459				BIT 1 FLAG 1		
0460		0035	AVEGFLAG =	029D	AVERAGEG (SERVICER)	AVERAGEG (SERVICER)
A0461					TO CONTINUE	TO CEASE
04615	REF 2 LAST 44	4712	AVEGBIT =	BIT1		
0462	REF 3 LAST 44	0076	FLAGWRD2 =	STATE +2	(030-044)	
A0463					(SET)	(RESET)
A0464				BIT 15 FLAG 2		
0465		0036	DRIFTFLG =	030D	T3RUPT CALLS GYRO	T3RUPT DOES NO GYRO
A0466					COMPENSATION	COMPENSATION
04665	REF 3 LAST 44	4674	DRFTBIT =	BIT15		
A0470				BIT 14 FLAG 2		
0471		0037	R21MARK =	031D	OPTION ONE FOR	OPTION TWO FOR
A0472					MARKRUPT	MARKRUPT
04725	REF 3 LAST 45	4675	R21BIT =	BIT14		

L ERASABLE ASSIGNMENTS USER'S PAGE NO. 14 EQ 53

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A0476                                          BIT 13 FLAG 2
 0477                  0040     22DSPFLG =      032D          DISPLAY DR,DV       DO NOT DISPLAY DR,DV

 04775 REF  3 LAST  45 4676     22DSPBIT =      BIT13

A0478                                          BIT 12 FLAG 2
A0479                          =               033D
A0480

A0481                                          BIT 11 FLAG 2
 0482                  0042     STEERSW  =      034D          STEERING TO BE DONE STEERING OMITTED

 04825 REF  3 LAST  45 4700     STEERBIT =      BIT11

A0483                                          BIT 10 FLAG 2
 0484                  0043     CYCLESW  =      035D          VG CALCULATION TO   VG CALCULATION
A0485                                                        BE DONE             OMITTED

 04855 REF  3 LAST  45 4701     CYCLEBIT =      BIT10

A0486                                          BIT 9 FLAG 2
 0487                  0044     IMPULSW  =      036D          MINIMUM IMPULSE     STEERING BURN (NO
A0488                                                        BURN (CUTOFF TIME   CUTOFF TIME YET
A0489                                                        SPECIFIED)          AVAILABLE)

 04895 REF  4 LAST  45 4702     IMPULBIT =      BIT9

A0490                                          BIT 8 FLAG 2
 0491                  0045     XDELVFLG =      037D          EXTERNAL DELTAV VG  LAMBERT (AIMPOINT)
A0492                                                        COMPUTATION         VG COMPUTATION

 04925 REF  3 LAST  45 4704     XDELVBIT =      BIT7

A0493                                          BIT 7 FLAG 2
 0494                  0046     ETPIFLAG =      038D          ELEVATION ANGLE     TPI TIME SUPPLIED
A0495                                                        SUPPLIED FOR P34,74 FOR P34,74

A0496                                          BIT 7 FLAG 2
 0497  REF  1         0046     FIRSTFLG =      ETPIFLAG      SUCCEEDING PASS     FIRST PASS THRU
A0498                                                        THRU S40.9          S40.9

 04985 REF  4 LAST  47 4704     FIRSTBIT =      BIT7

A0501                                          BIT  7 FLAG 2
 0502  REF  2 LAST  47 0046     OPTNSW   =      ETPIFLAG      SOI PHASE P38/P78   SOR PHASE OF P38/P78

 05025 REF  3 LAST  46 4705     FINALBIT =      BIT6

A0503                                          BIT 6 FLAG 2
```

```
 0504                           0047        FINALFLG =      039D        LSAT PASS THROUGH   INTERIM PASS THROUGH
A0505                                                                   RENDEZVOUS PROGRAM  RENDEZVOUS PROGRAM
A0506                                                                   COMPUTATIONS        COMPUTATIONS

 05065  REF   3  LAST   46      4706        AVFLBIT =       BIT5

A0507                                                   BIT 5 FLAG 2
 0508                           0050        AVFLAG  =       040D        LEM IS ACTIVE       CSM IS ACTIVE
A0509                                                                   VEHICLE             VEHICLE

A0510                                                   BIT 4 FLAG 2
 0511                           0051        PFRATFLG =      041D        PREFERRED ATTITUDE  PREFERRED ATTITUDE
A0512                                                                   COMPUTED            NOT COMPUTED

 05125  REF   3  LAST   46      4707        PFRATBIT =      BIT4

A0513                                                   BIT 3 FLAG 2
 0514                           0052        CALCMAN3 =      042D        NO FINAL ROLL       FINAL ROLL IS
A0515                                                                                       NECESSARY

 05155  REF   3  LAST   46      4710        CALC3BIT =      BIT3

A0516                                                   BIT 2 FLAG 2
 0517                           0053        CALCMAN2 =      043D        PERFORM MANEUVER    BYPASS STARTING
A0518                                                                   STARTING PROCEDURE  PROCEDURE

 05185  REF   2  LAST   46      4711        CALC2BIT =      BIT2

A0519                                                   BIT 1 FLAG 2
 0520                           0054        NODOFLAG =      044D        V37 NOT PERMITTED   V37 PERMITTED

 05205  REF   3  LAST   46      4712        NODOBIT  =      BIT1

 0521   REF   4  LAST   46      0077        FLAGWRD3 =      STATE +3    (045-059)

A0522                                                                  (SET)               (RESET)

A0523                                                   BIT 15 FLAG 3
A0524                                           =       045D
A0525

A0526                                                   BIT 14 FLAG 3
 0527                           0056        GLOKFAIL =      046D        GIMBAL LOCK HAS     NOT IN GIMBAL LOCK
A0528                                                                  OCCURED

 05285  REF   4  LAST   46      4675        GLOKFBIT =      BIT14

A0529                                                   BIT 13 FLAG 3
 0530                           0057        REFSMFLG =      047D        REFSMMAT GOOD       REFSMMAT NO GOOD
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 05305 REF   4 LAST   47      4676          REFSMBIT =      BIT13

A0531                                      BIT 12 FLAG 3
 0532                        0060          LUNAFLAG =      048D          LUNAR LAT-LONG      EARTH LAT-LONG

 05325 REF   2 LAST   43      4677          LUNABIT  =      BIT12

A0533                                      BIT 11 FLAG 3
 0534                        0061          P22MKFLG =      49D           P22 DOWNLINKED MARK P22 DOWLINK MARK
A0535                                                                    DATA WAS JUST TAKEN DATA NOT JUST TAKEN

 05355 REF   4 LAST   47      4700          P22MKBIT =      BIT11

A0537                                      BIT 10 FLAG 3
 0538                        0062          VFLAG    =      050D          LESS THAN TWO STARS TWO STARS IN FIELD
A0539                                                                    IN FIELD OF VIEW    OF VIEW

 05395 REF   4 LAST   47      4701          VFLAGBIT =      BIT10

A0540                                      BIT 9 FLAG 3
A0541                                  =   051D


A0542                                      BIT 8 FLAG 3
 0543                        0064          PRECIFLG =      052D          CSMPREC OR LEMPREC INTEGRV OR INTEGRVS
A0544                                                                    CALLED              CALLED

 05445 REF   3 LAST   45      4703          PRECIBIT =      BIT8

A0545                                      BIT 7 FLAG 3
 0546                        0065          CULTFLAG =      053D          STAR OCCULTED       STAR NOT OCCULTED

 05465 REF   5 LAST   47      4704          CULTBIT  =      BIT7

A0547                                      BIT 6 FLAG 3
 0548                        0066          ORBWFLAG =      054D          W MATRIX VALID FOR  W MATRIX INVALID FOR
A0549                                                                    ORBITAL NIVIGATION  ORBITAL NAVIGATION

 05495 REF   4 LAST   47      4705          ORBWFBIT =      BIT6

A0550                                      BIT 5 FLAG 3
 0551                        0067          STATEFLG =      055D          PERMANENT STATE     PERMANENT STATE
A0552                                                                    VECTOR UPDATED      VECTOR NOT UPDATED

 05525 REF   4 LAST   48      4706          STATEBIT =      BIT5

A0553                                      BIT 4 FLAG 3
 0554                        0070          INTYPFLG =      056D          CONIC INTEGRATION   ENCKE INTEGRATION

 05545 REF   4 LAST   48      4707          INTYBIT  =      BIT4
```

A0555				BIT 3 FLAG 3		
0556		0071	VINTFLAG =	057D	CSM STATE VECTOR BEING INTEGRATED	LEM STATE VECTOR BEING INTEGRATED
A0557						
05575	REF 4 LAST 4E	4710	VINTFBIT =	BIT3		
A0558				BIT 2 FLAG 3		
0559		0072	D60R9FLG =	058D	DIMENSION OF W IS 9 FOR INTEGRATION	DIMENSION OF W IS 6 FOR INTEGRATION
A0560						
05605	REF 3 LAST 4E	4711	D60R9BIT =	BIT2		
A0561				BIT 1 FLAG 3		
0562		0073	DIMOFLAG =	059D	W MATRIX IS TO BE USED	W MATRIX IS NOT TO BE USED
A0563						
0564	REF 5 LAST 4E	0100	FLAGWRD4 =	STATE +4	(060-074)	
A0565					(SET)	(RESET)
05655	REF 4 LAST 4E	4712	DIMOBIT =	BIT1		
A0566				BIT 15 FLAG 4		
0567		0074	MRKIDFLG =	060D	MARK DISPLAY IN ENDIDLE	NO MARK DISPLAY IN ENDIDLE
A0568						
05685	REF 4 LAST 46	4674	MRKIDBIT =	BIT15		
A0569				BIT 14 FLAG 4		
0570		0075	PRIODFLG =	061D	PRIORITY DISPLAY IN ENDIDLE	NO PRIORITY DISPLAY IN ENDIDLE
A0571						
05715	REF 5 LAST 4E	4675	PRIODBIT =	BIT14		
A0572				BIT 13 FLAG 4		
0573		0076	NRMIDFLG =	062D	NORMAL DISPLAY IN ENDIDLE	NO NORMAL DISPLAY IN ENDIDLE
A0574						
05745	REF 5 LAST 49	4676	NRMIDBIT =	BIT13		
A0575				BIT 12 FLAG 4		
0576		0077	PDSPFLAG =	063D	CAN'T INTERRUPT PRIORITY DISPLAY	SEE M. HAMILTON
A0577						
05775	REF 3 LAST 49	4677	PDSPFBIT =	BIT12		
A0578				BIT 11 FLAG 4		
0579		0100	MWAITFLG =	064D	HIGHER PRIORITY DISPLAY OPERATING WHEN MARK DISPLAY	NO HIGHER PRIORITY DISPLAY OPERATING WHEN MARK DISPLAY
A0580						
A0581						

A0582					INITIATED	INITIATED
05825	REF 5 LAST 49	4700	NWAITBIT =	BIT11		
A0583				BIT 10 FLAG 4		
0584		0101	NWAITFLG =	065D	HIGHER PRIORITY	NO HIGHER PRIORITY
A0585					DISPLAY OPERATING	DISPLAY OPERATING
A0586					WHEN NORMAL	WHEN NORMAL DISPLAY
A0587					DISPLAY INITIATED	INITIATED
05875	REF 5 LAST 49	4701	NWAITBIT =	BIT10		
A0588				BIT 9 FLAG 4		
0589		0102	MRKNVFLG =	066D	ASTRONAUT USING	ASTRONAUT NOT USING
A0590					KEYBOARD WHEN MARK	KEYBOARD WHEN MARK
A0591					DISPLAY INITIATED	DISPLAY INITIATED
05915	REF 5 LAST 47	4702	MRKNVBIT =	BIT9		
A0592				BIT 8 FLAG 4		
0593		0103	NRMNVFLG =	0670	ASTRONAUT USING	ASTRONAUT NOT USING
A0594					KEYBOARD WHEN	KEYBOARD WHEN
A0595					NORMAL DISPLAY	NORMAL DISPLAY
A0596					INITIATED	INITIATED
05965	REF 4 LAST 49	4703	NRMNVBIT =	BIT8		
A0597				BIT 7 FLAG 4		
0598		0104	PRONVFLG =	068D	ASTRONAUT USING	ASTRONAUT NOT USING
A0599					KEYBOARD WHEN	KEYBOARD WHEN
A0600					PRIORITY DISPLAY	PRIORITY DISPLAY
A0601					INITIATED	INITIATED
06015	REF 6 LAST 49	4704	PRONVBIT =	BIT7		
A0602				BIT 6 FLAG 4		
0603		0105	PINBRFLG =	069D	ASTRONAUT HAS	ASTRONAUT HAS NOT
A0604					INTERFERED WITH	INTERFERED WITH
A0605					EXISTING DISPLAY	EXISTING DISPLAY
06055	REF 5 LAST 49	4705	PINBRBIT =	BIT6		
A0606				BIT 5 FLAG 4		
0607		0106	MRUPTFLG =	070D	MARK DISPLAY	MARK DISPLAY NOT
A0608					INTERRUPTED BY	INTERRUPTED BY
A0609					PRIORITY DISPLAY	PRIORITY DISPLAY
06095	REF 5 LAST 49	4706	MRUPTBIT =	BIT5		
A0610				BIT 4 FLAG 4		

```
 0611                          0107        NRUPTFLG =      0710D       NORMAL DISPLAY      NORMAL DISPLAY NOT
A0612                                                                   INTERRUPTED BY      INTERRUPTED BY
A0613                                                                  PRIORITY OR MARK    PRIORITY OR MARK
A0614                                                                  DISPLAY             DISPLAY

 06145 REF   5 LAST   49       4707        NRUPTBIT =      BIT4

A0615                                                   BIT 3 FLAG 4
 0616                          0110        MKOVFLAG =      0720D       MARK DISPLAY OVER   NO MARK DISPLAY OVER
A0617                                                                  NORMAL              NORMAL

 06175 REF   5 LAST   5C       4710        MKOVBIT  =      BIT3

A06179                                                  BIT 2 FLAG 4  DISPLAY BIT
A0618                                           =       073D          CLEARED AT INTERVALS
A0619

A0620                                                   BIT 1 FLAG 4  MARK DISPLAY NOT TO NO SPECIAL MARK
 0621                          0112        XDSPFLAG =      074D        BE INTERRUPTED      INFORMATION.

 06215 REF   5 LAST   5C       4712        XDSPBIT  =      BIT1

 0622  REF   6 LAST   5C       0101        FLAGWRD5 =      STATE +5    (075-099)
A0623                                                                  (SET)               (RESET)

A0624                                                   BIT 15 FLAG 5
 0625                          0113        DSKYFLAG =      075D        DISPLAYS SENT TO    NO DISPLAYS TO DSKY
A0626                                                                  DSKY
A06265

 062655 REF  5 LAST   5C       4674        DSKYBIT  =      BIT15

A0627                                                   BIT 14 FLAG 5
A0628                                           =       76D

A0630                                                   BIT 13 FLAG 5
A0631                                           =       77D

A0637                                                   BIT 12 FLAG 5
 0638                          0116        V59FLAG  =      078D        CALIBRATING FOR     NORMAL MARKING FOR
A0639                                                                  P 23                P 23

 06395 REF   4 LAST   5C       4677        V59FLBIT =      BIT12

A0640                                                   BIT 11 FLAG 5
 0641                          0117        INCORFLG =      079D        FIRST INCORPORATION SECOND INCORPORATION

 06415 REF   6 LAST   51       4700        INCORBIT =      BIT11
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A0642
 0643                    0120        RNGSCFLG =      BIT 10 FLAG 5
                                                     80D             ANOTHER TAG FOR PRFTKAT

A0646
                                                     BIT 10 FLAG 5
 0647  REF   1           0120        PRFTRKAT =      RNGSCFLG        PREF TRACK ATT      +X AXIS TRACK ATT
A0648

 06485 REF   6 LAST  51  4701        PRFTRBIT =      BIT10

A0649
                                                     BIT 9 FLAG 5
 0650                    0121        DMENFLG  =      081D            DIMENSION OF W IS 9 DIMENSION OF W IS 6
A0651                                                                FOR INCORPORATION   FOR INCORPORATION

 06515 REF   6 LAST  51  4702        DMENFBIT =      BIT9

A0652
                                                     BIT 8 FLAG 5
 0653                    0122        COMPUTER =      082D            COMPUTER IS CMC     COMPUTER IS LGC

 06535 REF   5 LAST  51  4703        COMPTBIT =      BIT8

A0654
                                                     BIT 7 FLAG 5
 0655                    0123        ENGONFLG =      083D            ENGINE TURNED ON    ENGINE TURNED OFF

 06555 REF   7 LAST  51  4704        ENGONBIT =      BIT7

A0656
                                                     BIT 6 FLAG 5
 0657                    0124        3AXISFLG =      084D            MANEUVER SPECIFIED  MANEUVER SPECIFIED
A0658                                                                BY THREE AXES       BY ONE AXIS

 06585 REF   6 LAST  51  4705        3AXISBIT =      BIT6

A0662
                                                     BIT 5 FLAG 5
 0663                    0125        GRRBKFLG =      085D            BACKUP GRR RECEIVED BACKUP GRR NOT
A0664                                                                                    RECEIVED

 06645 REF   6 LAST  51  4706        GRRBKBIT =      BIT5

A0665
                                                     BIT 4 FLAG 5
 0666                    0126        R60FLAG  =      086D            R61 MUST USE R60    NORMAL R61
A0667

 06675 REF   6 LAST  52  4707        R60FLBIT =      BIT4

A0672
                                                     BIT 3 FLAG 5
 0673                    0127        SOLNSW   =      87D             LAMBERT DOES NOT    LAMBERT CONVERGES OR
A0674                                                                CONVERGE, OR TIME-  TIME-RADIUS NON
A06741                                               RADIUS NEARLY CIRC. CIRCULAR.
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 06745  REF   6  LAST   52      4710          SCLNSBIT =      BIT3

A0675                                        BIT 2 FLAG 5
 0676                          0130          MGLVFLAG =      088D          LOCAL VERTICAL      MIDDLE GIMBAL ANGLE
A0677                                                                      COORDINATES         COMPUTED
A0678                                                                      COMPUTED

 06785  REF   4  LAST   50      4711          MGLVFBIT =      BIT2

A0679                                        BIT 1 FLAG 5
 0680                          0131          RENDWFLG =      089D          W MATRIX VALID      W MATRIX INVALID
A0681                                                                      FOR RENDEZVOUS      FOR RENDEZVOUS
A0682                                                                      NAVIGATION          NAVIGATION

 06825  REF   6  LAST   52      4712          RENDWBIT =      BIT1

 0683   REF   7  LAST   52      0102          FLAGWRD6 =      STATE +6      (090-104)

A0684                                                                      (SET)               (RESET)

A0687                                        BIT 15 FLAG 6
 0688                          0132          CAPBIT1  =      090D          1 SATURN 1 TVC      0 RCS    0 NO

 06885  REF   6  LAST   52      4674          DAP1BIT  =      BIT15

A0689                                        BIT 14 FLAG 6
 0690                          0133          DAPBIT2  =      091D          1 A/P    0 A/P      1 A/P    0 A/P

 06905  REF   6  LAST   50      4675          DAP2BIT  =      BIT14

A0694                                        BIT 13 FLAG 6
 0695                          0134          STRULLSW =      92D           DO STEERULL         DO ULAGEOFF ONLY
A0696
 06965  REF   6  LAST   50      4676          STRULBIT =      BIT13

A0697                                        BIT 13 FLAG 6
 0698   REF   1                0134          ENTRYDSP =      STRULLSW      DO ENTRY DISPLAY    OMIT ENTRY DISPLAY
A0699                                                                      VIA ENTRYVN.

 06995  REF   7  LAST   54      4676          ENDSPBIT =      BIT13

A0706                                        BIT 12 FLAG 6
 0707                          0135          CMDAPARM =      093D          ALOW ENTRY FIRINGS  INHIBIT ENTRY FIRING
A0708                                                                      AND CALCULATIONS    AND CONTROL FUNCTION

 07085  REF   5  LAST   52      4677          CMARMBIT =      BIT12

A0709                                        BIT 11 FLAG 6
 0710                          0136          GAMDIFSW =      094D          CALCULATE GAMDOT    GAMDOT NOT TO BE
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L ERASABLE ASSIGNMENTS

A0711							CALCULATED
07115	REF 7 LAST 52	4700	GMDIFBIT =	BIT11			
A0712				BIT 10 FLAG 6			
0713		0137	GMBDRVSW =	095D	TRIMGIMB OVER	TRIMGIMB NOT OVER	
07135	REF 7 LAST 53	4701	GMBDRBIT =	BIT10			
A0714				BIT 10 FLAG 6			
0715	REF 1	0137	GONEPAST =	GMBDRVSW	LATERAL CONTROL CALCULATIONS TO BE OMITTED	LATERAL CONTROL CALCULATIONS TO BE DONE	
A0716							
A0717							
07175	REF 8 LAST 55	4701	GONEBIT =	BIT10			
A0718				BIT 9 FLAG 6			
0719		0140	RELVELSW =	096D	TARGETING USES EARTH-RELATIVE VELOCITY	TARGETING USES INERTIAL VELOCITY	
A0720							
A0721							
07215	REF 7 LAST 53	4702	RELVBIT =	BIT9			
A0724				BIT 8 FLAG 6			
0725		0141	EGSW =	097D	IN FINAL PHASE	NOT IN FINAL PHASE	
07255	REF 6 LAST 53	4703	EGFLGBIT =	BIT8			
A0726				BIT 8 FLAG 6			
0727	REF 1	0141	KNOWNFLG =	EGSW	LANDMARK KNOWN	LANDMARK UNKNOWN	
07275	REF 7 LAST 55	4703	KNOWNBIT =	BIT8			
A0728				BIT 8 FLAG 6			
0729	REF 1	0141	R57FLAG =	KNOWNFLG	DO NOT DO R57 TRUNION BIAS HAS BEEN OBTAINED.	DO R57, TRUNION BIAS NEEDED	
A0730							
A0731							
07315	REF 8 LAST 55	4703	R57BIT =	BIT8			
A0735				BIT 7 FLAG 6			
0736		0142	NOSWITCH =	098D	LATERAL ROLL	LATERAL ROLL MANUVER	
0737	REF 8 LAST 53	4704	NOSWBIT =	BIT7	MANUVER INHIBITED IN ENTRY	PERMITED IN ENTRY	
A07375							
A0740				BIT 6 FLAG 6			
0741		0143	HIND =	099D	ITERATING HUNTEST CALCULATIONS TO BE DONE AFTER RANGE	ITERATING OF HUNTEST CALCULATIONS TO BE OMITTED AFTER RANGE	
A0742							
A0743							

A0744						PREDICTION	PREDICTION
07445	REF 7 LAST 53	4705	HINCBIT =	BIT6			
A0748				BIT 5 FLAG 6			
0749		0144	INRLSW =	100D		INITIAL ROLL V(LV)	INITIAL ROLL V(LV)
A0750							
07505	REF 7 LAST 53	4706	INRLBIT =	BIT5			
A0751						ATTITUDE NOT HELD	ATTITUDE HELD
A0754				BIT 4 FLAG 6			
0755		0145	LATSW =	101D		DOWNLIFT NOT INHIBITED	DOWNLIFT INHIBITED
A0756							
07565	REF 7 LAST 53	4707	LATSWBIT =	BIT4			
A0759				BIT 3 FLAG 6			
0760		0146	.05GSW =	102D		DRAG OVER .05G	DRAG LESS THAN .05G
07605	REF 7 LAST 54	4710	.05GBIT =	BIT3			
A0761				BIT 3 FLAG 6			
0762		0146	NTARGFLG =	102D		ASTRONAUT DID OVERWRITE DELTA	ASTRONAUT DID NOT OVERWRITE DELTA
A0763							
07635	REF 8 LAST 56	4710	NTARGBIT =	BIT3			
A0764				BIT 2 FLAG 6			
0765		0147	CM/DSTBY =	103D		ENTRY DAP ACTIVATED	ENTRY DAP NOT ACTIVATED
A0766							
07665	REF 5 LAST 54	4711	CM/DSBIT =	BIT2			
A0769				BIT 1 FLAG 6			
0770		0150	GYMDIFSW =	104D		CDU DIFFERENCES AND BODY RATES COMPUTED	CDU DIFFERENCES AND BODY RATES NOT COMPUTED
A0775							
A0776							
07765	REF 7 LAST 54	4712	GYMDIBIT =	BIT1			
0777	REF 8 LAST 54	0103	FLAGWRD7 =	STATE +7		(105-119)	
A0778						(SET)	(RESET)
A0779				BIT 15 FLAG 7			
0780		0151	TERMIFLG =	105D		TERMINATE R21,R22	DO NOT TERMINATE R21,R22
A0781							
07815	REF 7 LAST 54	4674	TERMIBIT =	BIT15			

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A0786                                          BIT 14 FLAG 7
 0787                   0152    ITSWICH  =     1060          ACCEPT NEXT LAMBERT TEST LAMBERT ANSWER
A0788                                                        TPI SEARCH SOLUTION AGAINST LIMITS

 07885 REF   7 LAST  54 4675    ITSWBIT  =     BIT14

A0789                                          BIT 13 FLAG 7
 0790                   0153    IGNFLAG  =     1070          TIG HAS ARRIVED     TIG HAS NOT ARRIVED

 07905 REF   8 LAST  54 4676    IGNFLBIT =     BIT13

A0791                                          BIT 12 FLAG 7
 0792                   0154    ASTNFLAG =     108D          ASTRONAUT HAS       ASTRONAUT HAS NOT
A0793                                                        OKAYED IGNITION     OKAYED IGNITION

 07935 REF   6 LAST  54 4677    ASTNBIT  =     BIT12

A0794                                          BIT 11 FLAG 7
 0795                   0155    TIMRFLAG =     1090          CLOKTASK OPERATING  CLOKTASK INOPERATIVE

 07955 REF   8 LAST  55 4700    TIMRBIT  =     BIT11

A0799                                          BIT 10 FLAG 7
 0800                   0156    NORMSW   =     110D          UNIT NORMAL INPUT   LAMBERT COMPUTE ITS
A0801                                                       TO LAMBERT.         OWN UNIT NORMAL.

 08015 REF   9 LAST  55 4701    NORMSBIT =     BIT10

A0806                                          BIT 9 FLAG 7
 0807                   0157    RVSW     =     111D          DO NOT COMPUTE FINAL COMPUTE FINAL STATE
A08071                                                      STATE VECTOR IN     VECTOR IN TIME-THETA
A08075                                                      TIME-THETA.

 080755 REF  8 LAST  55 4702    RVSWBIT  =     BIT9

A0808                                          BIT 8 FLAG 7
 0809                   0160    GONEBY   =     112D          PASSED TARGET       APPROACHING TARGET

 08095 REF   9 LAST  55 4703    GONBYBIT =     BIT8

A0810                                          BIT 7 FLAG 7
 0811                   0161    IDLEFLAG =     113D          NO DV MONITOR       CONNECT DV MONITOR

 08115 REF   9 LAST  55 4704    IDLEFBIT =     BIT7

A0812                                          BIT 6 FLAG 7
 0813                   0162    V37FLAG  =     114D          AVERAGEG (SERVICER) AVERAGEG (SERVICER)
A0814                                                       RUNNING             OFF
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 08145  REF   8  LAST   56      4705          V37FLBIT =      BIT6

A0815                                                       BIT 5 FLAG 7
A0816                                              =        115D
A0817                                              =        BIT5
A0818

A0819                                                       BIT 4 FLAG 7
 0820                          0164          UPLOCKFL =      116D          K-KBAR-K FAIL       NO K-KBAR-K FAIL

 08205  REF   8  LAST   56      4707          UPLOCBIT =      BIT4

A0821                                                       BIT 3 FLAG 7
 0822                          0165          VERIFLAG =      117D          CHANGED WHEN V33E OCCURS AT END OF P27

 08225  REF   9  LAST   56      4710          VERIFBIT =      BIT3

A0823                                                       BIT 2 FLAG 7
 0824                          0166          ATTCHFLG =      118D          LM,CM ATTACHED      LM,CM NOT ATTACHED

 08245  REF   6  LAST   56      4711          ATTCHBIT =      BIT2

A0825                                                       BIT 1 FLAG 7
 0826                          0167          TFFSW    =      119D          CALCULATE TPERIGEE  CALCULATE TFF

 08265  REF   8  LAST   56      4712          TFFSWBIT =      BIT1

 0827   REF   9  LAST   56      0104          FLAGWRD8 =      STATE +8D     (120-134)

A0828                                                       (SET)               (RESET)

A0829                                                       BIT 15 FLAG 8
 0830                          0170          RPQFLAG  =      120D          RPQ NOT COMPUTED    RPQ COMPUTED

 08305  REF   8  LAST   56      4674          RPQFLBIT =      BIT15

A0831                                                       BIT 14 FLAG 8
A0832                                              =        121D
A0833

A0834                                                       BIT 13 FLAG 8
 0835                          0172          NEWIFLG  =      122D          FIRST PASS THROUGH  SUCCEEDING ITERATION
A0836                                                                     INTEGRATION         OF INTEGRATION

 08365  REF   9  LAST   57      4676          NEWIBIT  =      BIT13

A0837                                                       BIT 12 FLAG 8
 0838                          0173          CMOONFLG =      123D          PERMANENT CSM STATE PERMANENT CSM STATE
 0839   REF   7  LAST   57      4677          CMOONBIT =      BIT12         IN LUNAR SPHERE     IN EARTH SPHERE
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A0840                                                BIT 11 FLAG 8
 0841                    0174        LMOONFLG =      124D          PERMANENT LM  STATE PERMANENT LM  STATE
 0842  REF   9 LAST   57  4700        LMOONBIT =      BIT11         IN LUNAR SPHERE     IN EARTH SHPERE

A0843                                                BIT 10 FLAG 8
 0844                    0175        ADVTRK   =      125D          ADVANCE GROUND TRACK NOT ADVANCED
A0845                                                              SIGHTING WANTED     GROUND TRACK

 08455 REF  10 LAST   57  4701        ADVTKBIT =      BIT10

A0846                                                BIT 9 FLAG 8
 0847                    0176        P39/79SW =      126D          P39/79 OPERATING    P38/78 OPERATING
A0848
 08485 REF   9 LAST   57  4702        P39SWBIT =      BIT9

A0849                                                BIT 8 FLAG 8
 0850                    0177        SURFFLAG =      127D          LM ON LUNAR SURFACE LM NOT ON LUNAR
A0851                                                              SURFACE

 08515 REF  10 LAST   57  4703        SURFFBIT =      BIT8

A0854                                                BIT 7 FLAG 8
 0855                    0200        INFINFLG =      128D          NO CONIC SOLUTION   CONIC SOLUTION
A0856                                                              (CLOSURE THROUGH    EXISTS.
A08561                                                            INFINITY REQUIRED).

 08565 REF  10 LAST   57  4704        INFINBIT =      BIT7

A0857                                                BIT 6 FLAG 8
 0858                    0201        ORDERSW  =      129D          ITERATOR USES 2ND   ITERATOR USES 1ST
A08581                                                            ORDER MINIMUM MODE. ORDER STANDARD MODE.

 08585 REF   9 LAST   58  4705        ORDERBIT =      BIT6

A0859                                                BIT 5 FLAG 8
 0860                    0202        APSESW   =      130D          RDESIRED OUTSIDE    RDESIRED INSIDE
A08605                                                            PERICENTER-APOCENTER PERICENTER-APOCENTE
A0861                                                             RANGE IN TIME-RAD   RANGE IN TIME-RADIUS

 08615 REF   8 LAST   56  4706        APSESBIT =      BIT5

A0862                                                BIT 4 FLAG 8
 08625                   0203        COGAFLAG =      131D          NO CONIC  SOLUTION  CONIC SOLUTION
A0863                                                             TOO CLOSE TO        EXISTS (COGA DOES
A08631                                                            RECTILINEAR (COGA   NOT  OVERFLOW).
A0864                                                             OVERFLOWS).
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 08645  REF    9  LAST   58       4707          COGAFBIT =      BIT4

A0865                                                         BIT 3 FLAG 8
A0866                                                 =       132D
A0867

A0868                                                         BIT 2 FLAG 8
A0869                                                 =       133D


A0870                                                         BIT 1 FLAG 8
 0871                          0206                  360SW    =  134D          TRANSFER ANGLE NEAR TRANSFER ANGLE NOT
A0872                                                                          360 DEGREES          NEAR 360 DEGREES

 08725  REF    9  LAST   58       4712          360SWBIT =      BIT1

 0873   REF   10  LAST   58       0105          FLAGWRD9 =      STATE +9D        (135 - 149)

A0874                                                                          (SET)                (RESET)
A0875                                                         BIT 15 FLAG 9
 0876                          0207                  SWTOVER  =  135D          SWITCHOVER HAS       NO SWITCHOVER YET
A0877                                                                          OCCURRED

 08775  REF    9  LAST   58       4674          SWTOVBIT =      BIT15

A0878                                                         BIT 14 FLAG 9
 0879                          0210                  V67FLAG  =  136D          ASTRONAUT OVERWRITES ASTRONAUT DOES NOT
A08795                                                                         W MATRIX INITIAL     OVERWRITE INITIAL
A08796                                                                         VALUES               VALUES

 087965 REF    8  LAST   57       4675          V67FLBIT =      BIT14

A0880                                                         BIT 13 FLAG 9
 0881                          0211                  V82EMFLG =  137D          MOON VICINITY        EARTH VICINITY
A0881S


 088155 REF   10  LAST   58       4676          V82EMBIT =      BIT13

A0882                                                         BIT 12 FLAG 9
 0883                          0212                  MAXDBFLG =  138D          MAX DB SELECTED      MIN DB SELECTED
A0884

 08845  REF    8  LAST   58       4677          MAXDBBIT =      BIT12

A0885                                                         BIT 11 FLAG 9
 0886                          0213                  V94FLAG  =  139D          V94 ALLOWED DURING   V94 NOT ALLOWED
A0887                                                                          P23

 08875  REF   10  LAST   59       4700          V94FLBIT =      BIT11
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A0888                                          BIT 10 FLAG 9
 0889                  0214    SAVECFLG =      140D            P23 DISPLAY AND     P23 DISPLAY AND
A0890                                                         DATA STORAGE AFTER  DATA STORAGE BEFORE
A0891                                                         MARK IS DONE        MARK IS DONE

 08915 REF  11 LAST  59  4701    SAVECBIT =      BIT10

A0892                                          BIT  9 FLAG 9
 0893                  0215    VHFRFLAG =      141D            ALLOW R22 TO        STOP ACCEPTANCE
A0894                                                        ACCEPT RANGE        OF RANGE DATA
A0895                                                        DATA

 08955 REF  10 LAST  59  4702    VHFRBIT  =      BIT9

A0896                                          BIT  8 FLAG 9
 0897                  0216    SOURCFLG =      142D            SOURCE OF INPUT     SOURCE OF INPUT
A0898                                                        DATA IS FROM        DATA IS FROM
A0899                                                        VHF RADAR           OPTICS MARK

 08995 REF  11 LAST  59  4703    SOURCBIT =      BIT8

A0900                                          BIT  7 FLAG 9
 0901                  0217    R22CAFLG =      143D            R-22 CALCULATIONS   R-22 CALCULATIONS
A0902                                                        ARE GOING ON        ARE NOT GOING ON

 09025 REF  11 LAST  59  4704    R22CABIT =      BIT7

A0903                                          BIT  6 FLAG 9
 0904                  0220    N22ORN17 =      144D            COMPUTE TOTAL       COMPUTE TOTAL
A0905                                                        ATTITUDE ERRORS     ATTITUDE ERRORS
A0906                                                        WRT N22 (V62)       WRT N17 (V63)

 09065 REF  10 LAST  59  4705    N22178IT =      BIT6

A0907                                          BIT  5 FLAG 9
 0908                  0221    QUITFLAG =      145D

 09085 REF   9 LAST  59  4706    QUITBIT  =      BIT5

A0909                                          BIT  4 FLAG 9
 0910                  0222    R31FLAG  =      146D            R31 SELECTED (V83)  R34 SELECTED (V85)

 09105 REF  10 LAST  60  4707    R31FLBIT =      BIT4

A0911                                          BIT  3 FLAG 9
 0912                  0223    MID1FLAG =      147D            INTEGRATE TO TDEC   INTEGRATE TO THE
A0913                                                                               THEN-PRESENT TIME

 09135 REF  10 LAST  58  4710    MID1FBIT =      BIT3
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A0914                                          BIT  2 FLAG 9
 0915                   0224     MIDAVFLG =     148D          INTEGRATION ENTERED INTEGRATION WAS
A0916                                                         FROM ONE OF MIDTOAV NOT ENTERED VIA
A0917                                                          PORTALS             MIDTOAV

 09175 REF  7 LAST  58  4711     MIDAVBIT =     BIT2

A0918                                          BIT  1 FLAG 9
 0919                   0225     AVEMIDSW =     149D          AVETOMID CALLING    NO AVETOMID W INTEGR
A0920                                                         FOR W.MATRIX INTEGR ALLOW SET UP RN,VN,
A0921                                                         DONT WRITE OVER RN, PIPTIME
A0922                                                         VN,PIPTIME

 09225 REF 1C LAST  6C  4712     AVEMDBIT =     BIT1

A0923                                                        (SET)               (RESET)

 0924  REF 11 LAST  6C  0106     FLGWRD10 =     STATE  +10D   (150-164)
A0925


 09255 REF 12 LAST  62  0106     RASFLAG  =     STATE  +10D

A0926                                          BIT 15 FLAG 10
A0927                                  =       150D
A0928

A0929                                          BIT 14 FLAG 10
 0930                   0227     INTFLAG  =     151D          INTEGRATION IN      INTEGRATION NOT IN
A0931                                                        PROGRESS            PROGRESS
 09315 REF  9 LAST  60  4675     INTFLBIT =     BIT14

A0932                                          BIT 13 FLAG 10
A0933                                  =       152D
A0934

A0935                                          BIT 12 FLAG 10
A0936                                  =       153D

A0938                                          BIT 11 FLAG 10
A0939                                  =       154D

A0941                                          BIT 10 FLAG 10
A0942                                  =       155D
A0943

A0944                                          BIT  9 FLAG 10
A0945                                  =       156D
A0946
```

```
A0947                                          BIT  8 FLAG 10
A0948                                  =       157D
A0949

A0950                                          BIT  7 FLAG 10
 0951                    0236          REINTFLG =      158D          INTEGRATION ROUTINE INTEGRATION ROUTINE
A0952                                                                TO BE RESTARTED     NOT TO BE RESTARTED
 09525  REF  12  LAST   61    4704     REINTBIT =      BIT7

A0953                                          BIT  6 FLAG 10
A0954                                  =       159D
A0955

A0956                                          BIT  5 FLAG 10
A0957                                  =       160D
A0958

A0959                                          BIT  4 FLAG 10
A0960                                  =       161D
A0961

A0962                                          BIT  3 FLAG 10
A0963                                  =       162D
A0964

A0965                                          BIT  2 FLAG 10
A0966                                  =       163D
A0967

A0968                                          BIT  1 FLAG 10
A0969                                  =       164D
A0970

A0971

 0972   REF  13  LAST   62    0107     FLGWRD11 =      STATE +11D    (165 - 179)

A0973                                                                (SET)               (RESET)

A0974                                          BIT 15 FLAG 11
A0975                                  =       165D
A0976

A0977                                          BIT 14 FLAG 11
A0978                                  =       166D
A0979

A0980                                          BIT 13 FLAG 11
A0981                                  =       167D
```

```
A0982
A0983                           BIT 12 FLAG 11
A0984                   =       168D
A0985
A0986                           BIT 11 FLAG 11
A0987                   =       169D
A0988
A0989                           BIT 10 FLAG 11
A0990                   =       170D
A0991
A0992                           BIT  9 FLAG 11
A0993                   =       171D
A0994
A0995                           BIT  8 FLAG 11
A0996                   =       172D
A0997
A0998                           BIT  7 FLAG 11
A0999                   =       173D
A1000
A1001                           BIT  6 FLAG 11
A1002                   =       174D
A1003
A1004                           BIT  5 FLAG 11
A1005                   =       175D
A1006
A1007                           BIT  4 FLAG 11
A1008                   =       176D
A1009
A1010                           BIT  3 FLAG 11
A1011                   =       177D
A1012
A1013                           BIT  2 FLAG 11
A1014                   =       178D
A1015
A1016                           BIT  1 FLAG 11
A1017                   =       179D
A1018
```

P1019 GENERAL ERASABLE ASSIGNMENTS.

```
 1020                          0061                    SETLOC 61
R1021          INTERRUPT TEMPORARY STORAGE POOL.  (11D)
R1022           (ITEMP1 THROUGH RUPTREG4)

R1023          ANY OF THESE MAY BE USED AS TEMPORARIES DURING INTERRUPT OR WITH INTERRUPT INHIBITED. THE ITEMP SERIES
R1025  IS USED DURING CALLS TO THE EXECUTIVE AND WAITLIST - THE RUPTREGS ARE NOT.

 1027                          0061    0061    ITEMP1   ERASE
 1028  REF   1                 0061            WAITEXIT EQUALS ITEMP1
 1029  REF   2  LAST   65      0061            EXECTEM1 EQUALS ITEMP1

 1030                          0062    0062    ITEMP2   ERASE
 1031  REF   1                 0062            WAITBANK EQUALS ITEMP2
 1032  REF   2  LAST   65      0062            EXECTEM2 EQUALS ITEMP2

 1033                          0063    0063    ITEMP3   ERASE
 1034  REF   1                 0063            RUPTSTOR EQUALS ITEMP3
 1035  REF   2  LAST   65      0063            WAITADR  EQUALS ITEMP3
 1036  REF   3  LAST   65      0063            NEWPRIO  EQUALS ITEMP3

 1037                          0064    0064    ITEMP4   ERASE
 1038  REF   1                 0064            LOCCTR   EQUALS ITEMP4
 1039  REF   2  LAST   65      0064            WAITTEMP EQUALS ITEMP4

 1040                          0065    0065    ITEMP5   ERASE
 1041  REF   1                 0065            NEWLOC   EQUALS ITEMP5

 1042                          0066    0066    ITEMP6   ERASE
A1043                                          NEWLOC+1 EQUALS ITEMP6          DP ADDRESS.

 1044                          0067                    SETLOC 67
 1045                          0067    0067    NEWJOB   ERASE                  MUST BE AT LOC 67 DUE TO WIRING.


 1046                          0070    0070    RUPTREG1 ERASE
 1047                          0071    0071    RUPTREG2 ERASE
 1048                          0072    0072    RUPTREG3 ERASE
 1049                          0073    0073    RUPTREG4 ERASE
 1050  REF   1                 0073            KEYTEMP1 EQUALS RUPTREG4
 1051  REF   2  LAST   65      0073            DSRUPTEM EQUALS RUPTREG4

R1052          FLAGWORD RESERVATIONS.                                          (12D)

 1054                          0074    0107    STATE    ERASE  +11D

 1055                          0110    0113    FLAGFILL ERASE          +3      SPACE FOR FUTURE FLAGS
```

```
R1056           EXEC TEMPORARIES WHICH MAY BE USED BETWEEN CCS NEWJOBS.
R1057           (INTB15+ THROUGH RUPTMXM)                                   (32D)

 1059                                0114    0114    INTB15+  ERASE          REFLECTS 15TH BIT OF INDEXABLE ADDRESSES
 1060   REF   1                     0114            DSEXIT   EQUALS INTB15+  RETURN FOR DSPIN
 1061   REF   2  LAST  66           0114            EXITEM   EQUALS INTB15+  RETURN FOR SCALE FACTOR ROUTINE SELECT
 1062   REF   3  LAST  66           0114            BLANKRET EQUALS INTB15+  RETURN FOR 2BLANK

 1063                                0115    0115    INTBIT15 ERASE          SIMILAR TO ABOVE.
 1064   REF   1                     0115            WRDRET   EQUALS INTBIT15 RETURN FOR 5BLANK
 1065   REF   2  LAST  66           0115            WDRET    EQUALS INTBIT15 RETURN FOR DSPWD
 1066   REF   3  LAST  66           0115            DECRET   EQUALS INTBIT15 RETURN FOR PUTCOM(DEC LOAD)
 1067   REF   4  LAST  66           0115            21/22REG EQUALS INTBIT15 TEMP FOR CHARIN

R1068           THE REGISTERS BETWEEN ADDRWD AND PRIORITY MUST STAY IN THE FOLLOWING ORDER FOR INTERPRETIVE TRACE.

 1070                                0116    0116    ADDRWD   ERASE          12 BIT INTERPRETIVE OPERAND SUB-ADDRESS.
 1071                                0117    0117    POLISH   ERASE          HOLDS CADR MADE FROM POLISH ADDRESS.
 1072   REF   1                     0117            UPDATRET EQUALS POLISH   RETURN FOR UPDATNN, UPDATVB
 1073   REF   2  LAST  66           0117            CHAR     EQUALS POLISH   TEMP FOR CHARIN
 1074   REF   3  LAST  66           0117            ERCNT    EQUALS POLISH   COUNTER FOR ERROR LIGHT RESET
 1075   REF   4  LAST  66           0117            DECOUNT  EQUALS POLISH   COUNTER FOR SCALING AND DISPLAY (DEC)

 1076                                0120    0120    FIXLOC   ERASE          WORK AREA ADDRESS.
 1077                                0121    0121    OVFIND   ERASE          SET NON-ZERO ON OVERFLOW.

 1078                                0122    0127    VBUF     ERASE  +5       TEMPORARY STORAGE USED FOR VECTORS.
 1079   REF   1                     0122            SGNON    EQUALS VBUF     TEMP FOR +,- ON
 1080   REF   2  LAST  66           0122            NOUNTEM  EQUALS VBUF     COUNTER FOR MIXNOUN FETCH
 1081   REF   3  LAST  66           0122            DISTEM   EQUALS VBUF     COUNTER FOR OCTAL DISPLAY VERBS
 1082   REF   4  LAST  66           0122            DECTEM   EQUALS VBUF     COUNTER FOR FETCH (DEC DISPLAY VERBS)

 1083   REF   5  LAST  66           0123            SGNOFF   EQUALS VBUF  +1 TEMP FOR +,- ON
 1084   REF   6  LAST  66           0123            NVTEMP   EQUALS VBUF  +1 TEMP FOR NVSUB
 1085   REF   7  LAST  66           0123            SFTEMP1  EQUALS VBUF  +1 STORAGE FOR SF CONST HI PART(=SFTEMP2-1)
 1086   REF   8  LAST  66           0123            HITEMIN  EQUALS VBUF  +1 TEMP FOR LOAD OF HRS, MIN, SEC
A1087                                                                        MUST = LOTEMIN-1.
 1088   REF   9  LAST  66           0124            CODE     EQUALS VBUF  +2 FOR DSPIN
 1089   REF  10  LAST  66           0124            SFTEMP2  EQUALS VBUF  +2 STORAGE FOR SF CONST LO PART(=SFTEMP1+1)
 1090   REF  11  LAST  66           0124            LOTEMIN  EQUALS VBUF  +2 TEMP FOR LOAD OF HRS, MIN, SEC
A1091                                                                        MUST = HITEMIN+1.
 1092   REF  12  LAST  66           0125            MIXTEMP  EQUALS VBUF  +3 FOR MIXNOUN DATA
 1093   REF  13  LAST  66           0125            SIGNRET  EQUALS VBUF  +3 RETURN FOR +,- ON

R1094   ALSO MIXTEMP+1 = VBUF+4, MIXTEMP+2 = VBUF+5.

 1095                                0130    0132    BUF      ERASE  +2       TEMPORARY SCALAR STORAGE.
 1096                                0133    0134    BUF2     ERASE  +1
 1097   REF   1                     0130            INDEXLOC EQUALS BUF      CONTAINS ADDRESS OF SPECIFIED INDEX.
 1098   REF   2  LAST  66           0130            SWWORD   EQUALS BUF      ADDRESS OF SWITCH WORD.
```

```
1099  REF  3 LAST  66    0131          SWBIT    EQUALS BUF +1      SWITCH BIT WITHIN SWITCH WORD.
1100                     0135    0135  MPTEMP   ERASE              TEMPORARY USED IN MULTIPLY AND SHIFT.
1101  REF  1             0135          DMPNTEMP EQUALS MPTEMP      DMPSUB TEMPORARY
1102                     0136    0136  DOTINC   ERASE              COMPONENT INCREMENT FOR DOT SUBROUTINE.
1103  REF  1             0136          DVSIGN   EQUALS DOTINC      DETERMINES SIGN OF DDV RESULT.
1104  REF  2 LAST  67    0136          ESCAPE   EQUALS DOTINC      USED IN ARCSIN/ARCCOS.
1105  REF  3 LAST  67    0136          ENTRET   EQUALS DOTINC      EXIT FROM ENTER

1106                     0137    0137  DOTRET   ERASE              RETURN FROM DOT SUBROUTINE.
1107  REF  1             0137          DVNORMCT EQUALS DOTRET      DIVIDEND NORMALIZATION COUNT IN DDV.
1108  REF  2 LAST  67    0137          ESCAPE2  EQUALS DOTRET      ALTERNATE ARCSIN/ARCCOS SWITCH.
1109  REF  3 LAST  67    0137          WDCNT    EQUALS DOTRET      CHAR COUNTER FOR DSPWD
1110  REF  4 LAST  67    0137          INREL    EQUALS DOTRET      INPUT BUFFER SELECTOR ( X,Y,Z, REG )

1111                     0140    0140  MATINC   ERASE              VECTOR INCREMENT IN MXV AND VXM.
1112  REF  1             0140          MAXDVSW  EQUALS MATINC      +0 IF DP QUOTIENT IS NEAR ONE - ELSE -1.
1113  REF  2 LAST  67    0140          POLYCNT  EQUALS MATINC      POLYNOMIAL LOOP COUNTER
1114  REF  3 LAST  67    0140          DSPMMTEM EQUALS MATINC      DSPCOUNT SAVE FOR DSPMM
1115  REF  4 LAST  67    0140          MIXBR    EQUALS MATINC      INDICATOR FOR MIXED OR NORMAL NOUN

1116                     0141    0141  TEM1     ERASE              EXEC TEMP
1117  REF  1             0141          POLYRET  EQUALS TEM1
1118  REF  2 LAST  67    0141          DSREL    EQUALS TEM1        REL ADDRESS FOR DSPIN

1119                     0142    0142  TEM2     ERASE              EXEC TEMP
1120  REF  1             0142          DSMAG    EQUALS TEM2        MAGNITUDE STORE FOR DSPIN
1121  REF  2 LAST  67    0142          IDADDTEM EQUALS TEM2        MIXNOUN INDIRECT ADDRESS STORAGE

1122                     0143    0143  TEM3     ERASE              EXEC TEMP
1123  REF  1             0143          COUNT    EQUALS TEM3        FOR DSPIN

1124                     0144    0144  TEM4     ERASE              EXEC TEMP
1125  REF  1             0144          LSTPTR   EQUALS TEM4        LIST POINTER FOR GRABUSY
1126  REF  2 LAST  67    0144          RELRET   EQUALS TEM4        RETURN FOR RELDSP
1127  REF  3 LAST  67    0144          FREERET  EQUALS TEM4        RETURN FOR FREEDSP
1128  REF  4 LAST  67    0144          DSPWORET EQUALS TEM4        RETURN FOR DSPSIGN
1129  REF  5 LAST  67    0144          SEPSCRET EQUALS TEM4        RETURN FOR SEPSEC
1130  REF  6 LAST  67    0144          SEPMNRET EQUALS TEM4        RETURN FOR SEPMIN

1131                     0145    0145  TEM5     ERASE              EXEC TEMP
1132  REF  1             0145          NOUNADD  EQUALS TEM5        TEMP STORAGE FOR NOUN ADDRESS

1133                     0146    0146  NNADTEM  ERASE              TEMP FOR NOUN ADDRESS TABLE ENTRY
1134                     0147    0147  NNTYPTEM ERASE              TEMP FOR NOUN TYPE TABLE ENTRY
1135                     0150    0150  IDAD1TEM ERASE              TEMP FOR INDIR ADRESS TABLE ENTRY(MIXNN)
A1136                                                             MUST = IDAD2TEM-1, = IDAD3TEM-2.
1137                     0151    0151  IDAD2TEM ERASE              TEMP FOR INDIR ADRESS TABLE ENTRY(MIXNN)
A1138                                                             MUST = IDAD1TEM+1, = IDAD3TEM-1.
1139                     0152    0152  IDAD3TEM ERASE              TEMP FOR INDIR ADRESS TABLE ENTRY(MIXNN)
A1140                                                             MUST = IDAD1TEM+2, = IDAD2TEM+1.
```

L ERASABLE ASSIGNMENTS USER'S PAGE NO. 35 EO S3

```
 1141                          0153    0153   RUTNXTEM ERASE                 TEMP FOR SF ROUT TABLE ENTRY(MIXNN ONLY)

R1142          AX*SR*T STORAGE.                                              (6D)

 1144   REF  3  LAST  67      0142           DEXDEX   EQUALS TEM2            B(1)TMP
 1145   REF  2  LAST  67      0143           DEX1     EQUALS TEM3            B(1)TMP
 1146   REF  7  LAST  67      0144           DEX2     EQUALS TEM4            B(1)TMP
 1147   REF  2  LAST  67      0145           RTNSAVER EQUALS TEM5            B(1)TMP
 1148   REF  1                0133           TERM1TMP EQUALS BUF2            B(2)TMP

 1149   REF  1                0143           DEXI     =      DEX1
```

L ERASABLE ASSIGNMENTS USER'S PAGE NO. 36 EO S3

```
P1150           DYNAMICALLY ALLOCATED CORE SETS FOR JOBS.                    (84D)

 1152                       0154    0162    MPAC     ERASE  +6              MULTI-PURPOSE ACCUMULATOR.
 1153                       0163    0163    MODE     ERASE                  +1 FOR TP, +0 FOR DP, OR -1 FOR VECTOR.
 1154                       0164    0164    LOC      ERASE                  LOCATION ASSOCIATED WITH JOB.
 1155                       0165    0165    BANKSET  ERASE                  USUALLY CONTAINS BBANK SETTING.
 1156                       0166    0166    PUSHLOC  ERASE                  WORD OF PACKED INTERPRETIVE PARAMETERS.
 1157                       0167    0167    PRIORITY ERASE                  PRIORITY OF PRESENT JOB AND WORK AREA.

 1158                       0170    0277            ERASE  +71D             SEVEN SETS OF 12 REGISTERS EACH.

R1159           SPECIAL DOWNLINK BUFFER.-OVERLAYED BY P27 STORAGE-

R1160           P27(UPDATE PROGRAM) STORAGE. -OVERLAYS SPEC DNLNK BUFF-      (24D)

 1162                       0300    0327    COMPNUMB ERASE          +23D    B(1)TMP NUMBER OF ITEMS TO BE UPLINKED.
 1163   REF   1             0301            UPOLDMOD EQUALS COMPNUMB +1     B(1)TMP HOLDS INTERRUPTED PROGRAM NUMBER
 1164   REF   1             0302            UPVERB   EQUALS UPOLDMOD +1     B(1) TMP VERB NUMBER
 1165   REF   1             0303            UPCOUNT  EQUALS UPVERB   +1     B(1)TMP UPBUFF INDEX
 1166   REF   1             0304            UPBUFF   EQUALS UPCOUNT  +1     B(20D)

R1168           MORE P27 STORAGE.                                            (2D)

 1170                       0330    0330    UPTEMP   ERASE                  B(1)TMP SCRATCH
 1171                       0331    0331    UPVERBSV ERASE                  B(1)TMP
 1172   REF   1             0330            INTWAK1Q EQUALS UPTEMP          (06D)


R1180                   (20 REGISTERS OF ENTRY DOWNLINK WILL GO HERE.)

A1181                                                   THE FOLLOWING ARE INDEXED FOR TM. IN ENTRY DAP.

 1182   REF   1             0304            CMTMTIME =       UPBUFF         B(1) (VEHICLE BODY RATE INFO IS
 1183   REF   1             0305            SW/NDX   =       CMTMTIME +1    B(1)  TELEMETERED EACH 0.2 SEC. DURING
 1184   REF   2 LAST  69    0324            ENDBUF   =       CMTMTIME +16D  B(1)  ENTRY.)

 11842  REF   1             0325            V1       =       ENDBUF   +1    I(2) REENTRY, P64-P65
 11843  REF   1             0327            A0       =       V1       +2    I(2) REENTRY, P64-P65
A11844                                                                      HI-ORDER WORD ONLY ON DNLNK.
R1185

R1186           ALIGNMENT STORAGE.                                           (5D)
R1188           (CANNOT SHARE WITH PRECISION INTEGRATION OR KEPLER STORAGE.)

 1189   REF   2 LAST  69    0300            QMAJ     EQUALS COMPNUMB        B(1)TMP
 1190   REF   1             0301            MARKINDX EQUALS QMAJ     +1    B(1)TMP
 1191   REF   1             0302            BESTI    EQUALS MARKINDX +1    I(1)TMP
 1192   REF   1             0303            BESTJ    EQUALS BESTI    +1    I(1)TMP
 1193   REF   1             0304            STARIND  EQUALS BESTJ    +1    I(1)TMP
```

L ERASABLE ASSIGNMENTS

```
R1194           ALIGNMENT/S40.2.3 COMMON STORAGE.                          (18D)

 1196  REF  2 LAST  69      0306          XSMD     EQUALS UPBUFF   +2      I(6)TMP
 1197  REF  1               0314          YSMD     EQUALS XSMD     +6      I(6)TMP
 1198  REF  1               0322          ZSMD     EQUALS YSMD     +6      I(6)TMP

 1199  REF  2 LAST  7C      0306          XSCREF   =      XSMD                    SPACE CRAFT AXES IN REF COORDS.
 1200  REF  2 LAST  7C      0314          YSCREF   =      YSMD
 1201  REF  1               0322          ZSCREF   =      ZSMD


 1202                       0026          ZPRIME   =      22D
 1203                       0026          PDA      =      22D
 1204                       0020          COSTH    =      16D
 1205                       0022          SINTH    =      18D
 1206                       0024          THETA    =      20D
 1207                       0040          STARM    =      32D


R1208           DOWNLINK STORAGE.                                          (18)

12095  REF  1               0332          DNLSTADR EQUALS DNLSTCOD         CONTENTS NO LONGER AN ADDR BUT A CODE

 1210                       0332  0332    DNLSTCOD ERASE                   B(1)PRM ID CODE OF DOWNLIST
 1211                       0333  0333    DUMPCNT  ERASE                   B(1)PRM
 1212                       0334  0334    LDATALST ERASE                   B(1)
 1213                       0335  0335    DNTMGOTO ERASE                   B(1)
 1214                       0336  0336    TMINDEX  ERASE                   B(1)
 1215  REF  1               0336          DUMPLOC  EQUALS TMINDEX          CONTAINS ECADR OF AGC DP WORD BEING DUMP
A1216                                                                       ED AND COUNT OF COMPLETE DUMPS ALREADY S
A1217                                                                       ENT.
 1218                       0337  0337    DNQ      ERASE                   B(1)
 1219                       0340  0353    DNTMBUFF ERASE   +11D           B(12) PRM DOWNLINK SNAPSHOT BUFFER
A1220


R1221           OPTICS MARKING . UNSHARED.                                 (8D)

 1223                       0354  0354    MKNDX    ERASE
 1224                       0355  0356    MKT2T1   ERASE   +1
 1225                       0357  0357    MKCDUY   ERASE
 1226                       0360  0360    MKCDUS   ERASE
 1227                       0361  0361    MKCDUZ   ERASE
 1228                       0362  0362    MKCDUT   ERASE
 1229                       0363  0363    MKCDUX   ERASE
R1230           FOR EXCLUSIVE USE OF SYS TEST STANDARD LEAD INS            (2)

 1232                       0364  0365    EBUF2    ERASE   +1              B(2)   UNSHARED
A1233
```

```
R1234           UNSWITCHED FOR DISPLAY INTERFACE ROUTINES.                      (10D)

 1236                       0366    0366   RESTREG  ERASE                       B(1)PRM FOR DISPLAY RESTARTS
 1237                       0367    0367   NVWORD   ERASE
 1238                       0370    0370   MARKNV   ERASE
 1239                       0371    0371   NVSAVE   ERASE
R1240                (RETAIN THE ORDER OF CADRFLSH TO FAILREG +2 FOR DOWNLINK PURPOSES)
 1242                       0372    0372   CADRFLSH ERASE                       B(1)TMP
 1243                       0373    0373   CADRMARK ERASE                       B(1)TMP
 1244                       0374    0374   TEMPFLSH ERASE                       B(1)TMP
 1245                       0375    0377   FAILREG  ERASE          +2           B(3)PRM  3 ALARM-ABORT USER'S 2CADR

 1246                       0400           SETLOC 400
R1247           VAC AREAS.  -BE CAREFUL OF PLACEMENT-                           (220D)

 1249                       0400    0400   VAC1USE  ERASE                       B(1)PRM
 1250                       0401    0453   VAC1     ERASE  +42D                 B(43)PRM
 1251                       0454    0454   VAC2USE  ERASE                       B(1)PRM
 1252                       0455    0527   VAC2     ERASE  +42D                 B(43)PRM
 1253                       0530    0530   VAC3USE  ERASE                       B(1)PRM
 1254                       0531    0603   VAC3     ERASE  +42D                 B(43)PRM
 1255                       0604    0604   VAC4USE  ERASE                       B(1)PRM
 1256                       0605    0657   VAC4     ERASE  +42D                 B(43)PRM
 1257                       0660    0660   VAC5USE  ERASE                       B(1)PRM
 1258                       0661    0733   VAC5     ERASE  +42D                 B(43)PRM

R1259           WAITLIST REPEAT FLAG.                                           (1D)

 1261                       0734    0734   RUPTAGN  ERASE                       B(1)PRM
 1262  REF  1               0734           KEYTEMP2 =      RUPTAGN

R1263           STARALIGN ERASABLES.                                            (13D)

 1265                       0735    0735   STARCODE ERASE                       B(1)DSP NOUN 70 FOR P22,51 AND R52,53.
 1266                       0736    0751   STARALGN ERASE  +11D
 1267  REF  1               0736           SINCDU   =      STARALGN
 1268  REF  2  LAST  71     0744           COSCDU   =      STARALGN +6

 1269  REF  1               0742           SINCDUX  =      SINCDU   +4
 1270  REF  2  LAST  71     0736           SINCDUY  =      SINCDU
 1271  REF  3  LAST  71     0740           SINCDUZ  =      SINCDU   +2
 1272  REF  1               0750           COSCDUX  =      COSCDU   +4
 1273  REF  2  LAST  71     0744           COSCDUY  =      COSCDU
 1274  REF  3  LAST  71     0746           COSCDUZ  =      COSCDU   +2

R1275           PHASE TABLE AND RESTART COUNTERS.                               (12D)
```

```
1277                        0752    0752    -PHASE1  ERASE                  B(1)PRM
1278                        0753    0753    PHASE1   ERASE                  B(1)PRM
1279                        0754    0754    -PHASE2  ERASE                  B(1)PRM
1280                        0755    0755    PHASE2   ERASE                  B(1)PRM
1281                        0756    0756    -PHASE3  ERASE                  B(1)PRM
1282                        0757    0757    PHASE3   ERASE                  B(1)PRM
1283                        0760    0760    -PHASE4  ERASE                  B(1)PRM
1284                        0761    0761    PHASE4   ERASE                  B(1)PRM
1285                        0762    0762    -PHASE5  ERASE                  B(1)PRM
1286                        0763    0763    PHASE5   ERASE                  B(1)PRM
1287                        0764    0764    -PHASE6  ERASE                  B(1)PRM
1288                        0765    0765    PHASE6   ERASE                  B(1)PRM

R1289           AX*SR*T STORAGE.                                            (6D)

1291                        0766    0773    CDUSPOT  ERASE  +5              B(6)

1292  REF  1                0766            CDUSPOTY =      CDUSPOT
1293  REF  2  LAST  72      0770            CDUSPOTZ =      CDUSPOT +2
1294  REF  3  LAST  72      0772            CDUSPOTX =      CDUSPOT +4

R1299           VERB 37 STORAGE.                                            (2D)

1301                        0774    0774    MINDEX   ERASE                  B(1)TMP  INDEX FOR MAJOR MODE
1302                        0775    0775    MMNUMBER ERASE                  B(1)TMP  MAJOR MODE REQUESTED VIA V37

R1303           PINBALL INTERRUPT STORAGE.                                  (1D)

1305                        0776    0776    DSPCNT   ERASE                  B(1)PRM DSPCOUT COUNTER

R1306           PINBALL EXECUTIVE ACTION.                                   (44D)

1308                        0777    0777    DSPCOUNT ERASE                  DISPLAY POSITION INDICATOR
1309                        1000    1000    DECBRNCH ERASE                  +DEC, - DEC, OCT INDICATOR
1310                        1001    1001    VERBREG  ERASE                  VERB CODE
1311                        1002    1002    NOUNREG  ERASE                  NOUN CODE
1312                        1003    1003    XREG     ERASE                  R1 INPUT BUFFER
1313                        1004    1004    YREG     ERASE                  R2 INPUT BUFFER
1314                        1005    1005    ZREG     ERASE                  R3 INPUT BUFFER
1315                        1006    1006    XREGLP   ERASE                  LO PART OF XREG (FOR DEC CONV ONLY)
1316                        1007    1007    YREGLP   ERASE                  LO PART OF YREG (FOR DEC CONV ONLY)
1317  REF  1                1007            HITEMOUT =      YREGLP         TEMP FOR DISPLAY OF HRS, MIN, SEC
A1318                                                                               MUST = LOTEMOUT-1.
1319                        1010    1010    ZREGLP   ERASE                  LO PART OF ZREG (FOR DEC CONV ONLY)
1320  REF  1                1010            LOTEMOUT =      ZREGLP         TEMP FOR DISPLAY OF HRS, MIN, SEC
A1321                                                                               MUST = HITEMOUT+1.
```

```
 1322                    1011    1011    MODREG   ERASE                  MODE CODE
 1323                    1012    1012    DSPLOCK  ERASE                  KEYBOARD/SUBROUTINE CALL INTERLOCK
 1324                    1013    1013    REQRET   ERASE                  RETURN REGISTER FOR LOAD
 1325                    1014    1014    LOADSTAT ERASE                  STATUS INDICATOR FOR LOADTST
 1326                    1015    1015    CLPASS   ERASE                  PASS INDICATOR CLEAR
 1327                    1016    1016    NOUT     ERASE                  ACTIVITY COUNTER FOR DSPTAB
 1328                    1017    1017    NOUNCADR ERASE                  MACHINE CADR FOR NOUN
 1329                    1020    1020    MONSAVE  ERASE                  N/V CODE FOR MONITOR. (= MONSAVE1-1)
 1330                    1021    1021    MONSAVE1 ERASE                  NOUNCADR FOR MONITOR(MATBS) =MONSAVE +1
 1331                    1022    1022    MONSAVE2 ERASE                  B(1)PRM NVMONOPT OPTIONS
 1332                    1023    1036    DSPTAB   ERASE  +11D           0-10D, DISPLAY PANEL BUFF. 11D, C/S LTS.
 1333                    1037    1037    NVQTEM   ERASE                  NVSUB STORAGE FOR CALLING ADDRESS
A1334                                                                    MUST = NVBNKTEM-1
 1335                    1040    1040    NVBNKTEM ERASE                  NVSUB STORAGE FOR CALLING BANK
A1336                                                                    MUST = NVQTEM+1
 1337                    1041    1041    VERBSAVE ERASE                  NEEDED FOR RECYCLE
 1338                    1042    1042    CADRSTOR ERASE                  ENDIDLE STORAGE
 1339                    1043    1043    DSPLIST  ERASE                  WAITING REG FOR DSP SYST INTERNAL USE
 1340                    1044    1044    EXTVBACT ERASE                  EXTENDED VERB ACTIVITY INTERLOCK
 1341                    1045    1047    DSPTEM1  ERASE         +2       BUFFER STORAGE AREA 1 (MOSTLY FOR TIME)
 1342                    1050    1052    DSPTEM2  ERASE         +2       BUFFER STORAGE AREA 2 (MOSTLY FOR DEC)

 1343   REF   1                 1051            DSPTEMX  EQUALS DSPTEM2  +1   B(2) S-S DISPLAY BUFFER FOR EXT. VERBS.
 1344   REF   1                 1045            NORMTEM1 EQUALS DSPTEM1      B(3)DSP NORMAL DISPLAY REGISTERS.
A1345

R13451                  DISPLAY FOR EXTENDED VERBS                      (2D)

 13453  REF   1                 1051            OPTIONX  EQUALS DSPTEMX      B(2) EXTENDED VERB OPTION CODE  NI2(V82)
A13454

R1346                   TBASE S AND PHSPROT S.                          (12D)

 1348                    1053    1053    TBASE1   ERASE                  B(1)PRM
 1349                    1054    1054    PHSPROT1 ERASE                  B(1)PRM
 1350                    1055    1055    TBASE2   ERASE                  B(1)PRM
 1351                    1056    1056    PHSPROT2 ERASE                  B(1)PRM
 1352                    1057    1057    TBASE3   ERASE                  B(1)PRM
 1353                    1060    1060    PHSPROT3 ERASE                  B(1)PRM
 1354                    1061    1061    TBASE4   ERASE                  B(1)PRM
 1355                    1062    1062    PHSPROT4 ERASE                  B(1)PRM
 1356                    1063    1063    TBASE5   ERASE                  B(1)PRM
 1357                    1064    1064    PHSPROT5 ERASE                  B(1)PRM
 1358                    1065    1065    TBASE6   ERASE                  B(1)PRM
 1359                    1066    1066    PHSPROT6 ERASE                  B(1)PRM

R1360                   MORE UNSWITCHED FOR DISPLAY INF                 (5D).
```

```
1362                        1067    1067    EBANKSAV ERASE
1363                        1070    1070    MARKEBAN ERASE
1364                        1071    1071    EBANKTEM ERASE
1365                        1072    1072    MARK2PAC ERASE
1366                        1073    1073    RISAVE   ERASE

R1367           IMU COMPENSATION UNSWITCHED ERASABLE.                   (1D)

1369                        1074    1074    1/PIPADT ERASE              B(1)PRM
1370  REF   1               1074            OLDBT1   =      1/PIPADT

R1371           SINGLE PRECISION SUBROUTINE TEMPORARIES.                (3D)

A1373                                                   SPSIN, SPCOS, SPROOT VARIABLES.
A1374                                                   DO NOT SHARE. THESE ARE USED BY DAPS IN INTERRUPT
A1375                                                   AND CURRENTLY ARE NOT PROTECTED. IF OTHER USERS
A1376                                                   MATERIALIZE, THEN THIS CAN BE CHANGED.

1377                        1075    1075    HALFY    ERASE
1378                        1076    1076    ROOTRET  ERASE
1379                        1077    1077    SQRARG   ERASE
1380  REF   1               1075            TEMK     EQUALS HALFY
1381  REF   1               1076            SQ       EQUALS ROOTRET
```

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P1382           UNSWITCHED FOR ORBIT INTEGRATION.                       (210)

 1384                           1100    1124    TDEC    ERASE   +200            I(2)
 1385   REF   1                 1102            COLREG  EQUALS  TDEC    +2    I(1)
 1386   REF   1                 1103            LAT     EQUALS  COLREG  +1    I(2)DSP NOUN 43,67 FOR P20,22,51 R52,53.
 1387   REF   1                 1103            LANDLAT =       LAT           NOUN 89    FOR P22.
 1388   REF   2 LAST   75       1105            LONG    EQUALS  LAT     +2    I(2)DSP NOUN 43,67 FOR P20,22,51 R52,53.
 1389   REF   1                 1107            ALT     EQUALS  LONG    +2    I(2)DSP NOUN 43    FOR P20,22,51 R52,53.
 1390   REF   1                 1111            VV      EQUALS  ALT     +2    I(6)
 1391   REF   1                 1117            ZV      EQUALS  VV      +6    I(6)
R1392

R1393           MARK STORAGE.                                           (2)

 1395                           1125    1125    VHFCNT  ERASE                 B(1) PRM NO. OF VHF MARKS(P20(R22)).
 1396                           1126    1126    TRKMKCNT ERASE                B(1) PRM NO. OF VHF MARKS (P20(R22)).

 1397   REF   1                 1126            MARKCTR =       TRKMKCNT      B(1) MARK COUNTER USED BY R32

R1398           MISCELLANEOUS UNSWITCHED.                               (160)

 1400                           1127    1127    IRETURN1 ERASE                B(1)  RET ADDR USED BY MIDTOAV1 AND 2
A1401                                                                          CALLED BY P40,P41,P42,  P61,P62
 1402                           1130    1130    RATEINDX ERASE                 (1)    USED BY KALCMANU
 1403                           1131    1131    OPTION1 ERASE                 B(1)   NOUN 06 USES THIS
 1404                           1132    1132    OPTION2 ERASE                 B(1)   NOUN 06 USES THIS
 1405                           1133    1134    LONGCADR ERASE  +1            B(2)    LONGCALL REGISTER
 1406                           1135    1136    LONGBASE ERASE  +1            B(2)    LONGCALL REGISTER
 1407                           1137    1140    LONGTIME ERASE  +1            B(2)    LONGCALL REGISTER
 1408                           1141    1144    DELAYLOC ERASE          +3
 1409                           1145    1145    NVWORD1 ERASE                 B(1)
 1410                           1146    1146    TEMPR60 ERASE                 B(1)
 1411                           1147    1147    PRIOTIME ERASE                B(1)
 1412   REF   1                 1127            P30/RET EQUALS  IRETURN1
A14125

R14125          MISC. INCLUDING RESTART COUNTER, GIMBAL ANGLE SAVE AND
R1413           STANDBY VERB ERASABLES. REDOCTR BEFORE THETAD (DWNLNK)  (160)

 1415                           1150    1151    TIME2SAV ERASE  +1            B(2)TMP
 1416                           1152    1153    SCALSAVE ERASE  +1            B(2)TMP
 1417                           1154    1154    REDOCTR ERASE                 B(1)PRM CONTAINS NUMBER OF RESTARTS.
 1418                           1155    1157    THETAD  ERASE   +2            B(3)PRM DESIRED GIM ANGLES FOR MANEUVER.
 1419   REF   1                 1155            CPHI    =       THETAD                (OUTER)
 1420   REF   2 LAST   75       1156            CTHETA  =       THETAD  +1            (INNER)
 1421   REF   3 LAST   75       1157            CPSI    =       THETAD  +2            (MIDDLE)
```

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R14211          ENTRY VARIABLES SHARED FOR TM.

 14212  REF   4  LAST   75      1155           RDOTREF  =       THETAD          I(2)    P65
 14213  REF   1                 1157           VREF     =       RDOTREF +2      I(2)    P65   HI-ORDER WORD ONLY DNLNK'D
 1422                           1160    1160   DESOPTT  ERASE                   B(1)DSP NOUN 92 FOR P20,22,52, R52.
 1423                           1161    1161   DESOPTS  ERASE                   B(1)DSP NOUN 92 FOR P20,22,52, R52.

 1424                           1162    1167   DELV     ERASE   +5              I(6)
 1425  REF   1                 1162           DELVX    =       DELV
 1426  REF   2  LAST   76      1164           DELVY    =       DELV    +2
 1427  REF   3  LAST   76      1166           DELVZ    =       DELV    +4


R14271          P20, CONICS   (SHARING WITH TIME 2 SAV AND SCAL SAV ONLY)      (3D)

 14273  REF   1                 1150           POINTEX  EQUALS  TIME2SAV       I(1) POINT AXS EXIT
 14274  REF   1                 1151           VHFTIME  EQUALS  POINTEX  +1    I(2) DOWNLINK OF VHF RANGE TIME +1M
A14275


R1428           PERM STATE VECTORS FOR BOOST AND DOWNLINK -WHOLE MISSION-      (140)

 1430                           1170    1175   RN       ERASE   +5              B(6)PRM
 1431                           1176    1203   VN       ERASE   +5              B(6)PRM
 1432                           1204    1205   PIPTIME  ERASE   +1              B(2)PRM (MUST BE FOLLOWED BY GDT/2)


R1433           SERVICER STORAGE.                                              (45D)

R1435           (SERVICER STORAGE AND P11 STORAGE IN UNSWITHCHED SHOULD NOT
R1436           OVERLAY EACH OTHER AND THE TOTAL ERASABLE REQUIRED SHOULD NOT
R1437           EXCEED THE ERASABLE STORAGE REQUIRED BY RENDEZVOUS GUIDANCE)

 1438  REF   1                 1206           GDT/2    EQUALS  PIPTIME  +2     B(6)TMP (MUST FOLLOW PIPTIME)
 1439  REF   1                 1214           GOBL/2   EQUALS  GDT/2    +6     B(6)TMP
 1440  REF   1                 1222           AVEGEXIT EQUALS  GOBL/2   +6     B(2)TMP
 1441  REF   1                 1222           AVGEXIT  =       AVEGEXIT
 1442  REF   2  LAST   76      1224           TEMX     EQUALS  AVEGEXIT +2     B(1)TMP
 1443  REF   1                 1225           TEMY     EQUALS  TEMX     +1     B(1)TMP
 1444  REF   1                 1226           TEMZ     EQUALS  TEMY     +1     B(1)TMP
 1445  REF   1                 1227           PIPCTR   EQUALS  TEMZ     +1     B(1)TMP
 1446  REF   1                 1230           PIPAGE   EQUALS  PIPCTR   +1     B(1)TMP

 1447  REF   1                 1231           RN1      EQUALS  PIPAGE  +1     B(6)TMP
 1448  REF   3  LAST   32      1237           VN1      EQUALS  RN1      +6     B(6)TMP
 1449  REF   1                 1245           PIPTIME1 EQUALS  VN1      +6     B(2)TMP
 1450  REF   1                 1247           GDT1/2   EQUALS  PIPTIME1 +2     B(6)TMP
 1451  REF   1                 1255           GOBL1/2  EQUALS  GDT1/2   +6     B(6)TMP
A1452
```

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```
R1453           ENTRY STORAGE.                                          (1D)

 1455   REF  1          1263        ENTRYVN  EQUALS GOBL1/2  +6      B(1)TMP VN CODE FOR ENTRY DISPLAYS P60S.
A1456


R1457           P11 STORAGE.                                            (9D)

 1459   REF  1          1263        PADLONG  EQUALS ENTRYVN           (2)PL   LONGITUDE OF LAUNCH PAD
 1460   REF  1          1265        LIFTTEMP EQUALS PADLONG  +2       (2)TMP
 1461   REF  1          1267        TEPHEM1  EQUALS LIFTTEMP +2       (3)TMP
 1462   REF  1          1272        PGNCSALT EQUALS TEPHEM1  +3       (2)PL   ALTITUDE


R1463           RENDEZVOUS NAVIGATION STORAGE.(SEE COMMENT IN SERVICER STORAGE)(58D)

 1465                    1206   1277 CSMPOS   ERASE  +57D             I(6)TMP
 1466   REF  1          1214        LEMPOS   EQUALS CSMPOS   +6       I(6)TMP
 1467   REF  1          1222        RCL      EQUALS LEMPOS   +6       I(2)TMP
 1468   REF  1          1224        MARKTIME EQUALS RCL      +2       B(2)TMP
 1469   REF  1          1226        VTEMP    EQUALS MARKTIME +2       B(6)TMP
 1470   REF  1          1234        UM       EQUALS VTEMP    +6       I(6)TMP
 1471   REF  1          1242        MARKDATA EQUALS UM       +6       B(2)TMP
 1472   REF  1          1244        USTAR    EQUALS MARKDATA +2       I(6)TMP
 1473   REF  1          1252        WIXA     EQUALS USTAR    +6       B(1)TMP
 1474   REF  1          1253        WIXB     EQUALS WIXA     +1       B(1)TMP
 1475   REF  1          1254        ZIXA     EQUALS WIXB     +1       B(1)TMP
 1476   REF  1          1255        ZIXB     EQUALS ZIXA     +1       B(1)TMP
 1477   REF  1          1256        DELTAX   EQUALS ZIXB     +1       I(18)TMP

 1478   REF  1          1256        VHFRANGE EQUALS DELTAX            (2)
 1479   REF  2 LAST 77  1272        UCL      EQUALS DELTAX   +12D     (6)     LM-CSM LINE OF SIGHT 1/2 UNIT V


R1480           **** CONICSEX (MEAS INC) ****

 1481   REF  3 LAST 77  1256        TRIPA    EQUALS DELTAX
 1482   REF  4 LAST 77  1261        TEMPVAR  EQUALS DELTAX   +3
A1483


 1484                    1300   1301 TEMPOR1  ERASE  +1              B(2)TMP


R1485           T4RUPT ERASABLE.                                        (6D)

 1487                    1302   1302 DSRUPTSW ERASE
 1488                    1303   1303 OPTIND   ERASE
 1489                    1304   1304 LGYRO    ERASE
 1490                    1305   1306 COMMANDO ERASE  +1
```

```
 1491                          1307    1307    ZONE     ERASE          8(1)PRM USED IN SHAFT STOP MONITOR
 1492  REF   1                 0035            LASTYCMD =      OPTY    DUMMY TO MAKE RR BENCH TEST ASSEMBLE
 1493  REF   2  LAST  78       0035            LASTXCMD =      OPTY    DUMMY TO MAKE RR BENCH TEST ASSEMBLE

R1494          LASWITCHED DAP ERASABLE.                                (4D)

 1496                          1310    1310    T6LOC    ERASE
 1497                          1311    1311    T6ADR    ERASE
 1498                          1312    1313    T5LOC    ERASE  +1

R1499          MODE SWITCHING ERASABLE.                                (14D)

 1501                          1314    1314    SWSAMPLE ERASE          8(1)PRM
 1502                          1315    1315    DESDPMOD ERASE          8(1)PRM
 1503                          1316    1316    WTOPTION ERASE          8(1)PRM
 1504                          1317    1317    ZOPTCNT  ERASE          8(1)PRM
 1505                          1320    1320    IMODES30 ERASE          8(1)PRM
 1506                          1321    1321    IMODES33 ERASE          8(1)PRM
 1507                          1322    1324    MODECADR ERASE  +2      8(3)TMP
 1508  REF   1                 1322            IMUCADR  =      MODECADR
 1509  REF   2  LAST  78       1323            OPTCADR  =      MODECADR +1
 1510  REF   3  LAST  78       1324            RADCADR  =      MODECADR +2
 1511                          1325    1327    ATTCADR  ERASE  +2      8(3)PRM
 1512  REF   1                 1327            ATTPRIO  =      ATTCADR  +2
 1513                          1330    1330    MARKSTAT ERASE          8(1)PRM
 1514                          1331    1331    OPTMODES ERASE          8(1)PRM
A1515

R1516          RCSDAP ERASABLE.                                        (1D)

 1518                          1332    1332    HOLDFLAG ERASE          8(1)PRM
A1519

A1520

R1524          CRS61.1 STORAGE.  -USED IN R63 (VERB 89)-               (5D)

 1526                          1333    1335    CPHIX    ERASE  +2      8(3)DSP NOUN 96 CALCULATED BY CRS61.1
A1527

 1528                          1336    1337    TEVENT   ERASE  +1      8(2)     TIME OF EVENT FOR DOWNLIST
 1529  REF   1                 1336            TLIFTOFF =      TEVENT
```

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```
R1530           P34-P35 STORAGE                                         (1D)

 1532                       1340    1340    NORMEX   ERASE
A1533


R1535           SELF-CHECK ASSIGNMENTS.                                 (17D)

R1537                              (DO NOT MOVE, S-C IS ADDRESS SENSITIVE)

 1538                       1357    1377    SELFERAS ERASE  1357 - 1377    ***MUST NOT BE MOVED***
 1539   REF   1            1357            SFAIL    EQUALS SELFERAS        B(1)
 1540   REF   1            1360            ERESTORE EQUALS SFAIL    +1    B(1)
 1541   REF   1            1361            SELFRET  EQUALS ERESTORE +1    B(1)    RETURN
 1542   REF   1            1362            SMODE    EQUALS SELFRET  +1    B(1)
 1543   REF   1            1363            ALMCADR  EQUALS SMODE    +1    B(2)    ALARM-ABORT USER'S 2CADR
 1544   REF   1            1365            ERCOUNT  EQUALS ALMCADR  +2    B(1)
 1545   REF   1            1366            SCOUNT   EQUALS ERCOUNT  +1    B(3)
 1546   REF   1            1371            SKEEP1   EQUALS SCOUNT   +3    B(1)
 1547   REF   1            1372            SKEEP2   EQUALS SKEEP1   +1    B(1)
 1548   REF   1            1373            SKEEP3   EQUALS SKEEP2   +1    B(1)
 1549   REF   1            1374            SKEEP4   EQUALS SKEEP3   +1    B(1)
 1550   REF   1            1375            SKEEP5   EQUALS SKEEP4   +1    B(1)
 1551   REF   1            1376            SKEEP6   EQUALS SKEEP5   +1    B(1)
 1552   REF   1            1377            SKEEP7   EQUALS SKEEP6   +1    B(1)

A1553


R1554           USED BY P30 ROUTINES TO WRITE ONLY NEVER READ IN COLOSSUS

 1555   REF   1                    0000            DISPDEX  EQUALS A
R1556           ERASABLE FOR SXTMARK CDU CHECK DELAY.  -PAD LOADED-     (1D)

 1558                       1341    1341    CDUCHKWD ERASE                 B(1) PL


R1558.2         R57 STORAGE. -MUST BE UNSHARED EXCEPT IN BOOST OR ENTRY-  (1D)

 1558.3                     1342    1342    TRUNBIAS ERASE                 B(1)PRM RESULT OF R57 CALIBR OF TRUNION
A1558.4


R1558.5         KEPLER  STORAGE                                         (6D)

 1558.7                     1343    1344    XMODULO  ERASE           +1    I(2) GREATER 2PI KEPLER
 1558.8                     1345    1346    TMODULO  ERASE           +1    I(2) GREATER 2 KEPLER
 1558.9                     1347    1350    EPSILONT ERASE           +1    I(2) TMP
A1559
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```
R1560           P37   **RETURN TO EARTH  (PAD LOAD) ****                    (2D)

 1561                         1351    1352   RTED1    ERASE          +1     I(2)PL VGAMMA POLY COEF                    B-3

R1562           P40   ***STEERING ROUTINE*** PAD LOAD                       (1D)

 1564                         1353    1353   DVTHRESH ERASE                 I(1)PL  DELTA V THRESHOLD FOR LOW THRUST
A1565                                                                               ROUTINE                          B-2

R15651          P23   ***PAD LOAD****                                       (2D)

 15653                        1354    1355   HORIZALT ERASE          +1     I(2)PL  HORIZION ALTITUDE        M  B-29

R1566           P-20        ALTERNATE LOS VARIANCE     PAD LOAD*****       (1D)

A1568                                                                                                        -16
 1569                         1356    1356   ALTVAR   ERASE                 I(2)PL MILLARD. SQUARED SCALED 2

 1570  REF  2 LAST  79       1377           END-UE   EQUALS SELFERAS +16D   LAST USED UNSWITCHED ERASABLE
```

```
P3000                   EBANK=3 ASSIGNMENTS

 3001                       E3,1400                      SETLOC 1400

R3002           WAITLIST TASK LISTS.                                        (26D)

 3004                       E3,1400  E3,1407  LST1       ERASE  +7        B(8D)PRM  DELTA T S.
 3005                       E3,1410  E3,1431  LST2       ERASE  +17D      B(18D)PRM TASK 2CADR ADDRESSES.

R3006           RESTART STORAGE.                                            (2D)

 3008                       E3,1432  E3,1433  RSBBQ      ERASE  +1        B(2)PRM SAVE BB AND Q FOR RESTARTS.

R3009           MORE LONGCALL STORAGE. (MUST BE IN LST1 S BANK).            (2D)

 3011                       E3,1434  E3,1435  LONGEXIT   ERASE  +1        B(2)TMP MAY BE SELDOM OVERLAYED.

R3012           PHASE-CHANGE LISTS PART II.                                 (12D)

 3014                       E3,1436  E3,1436  PHSNAME1   ERASE            B(1)PRM
 3015                       E3,1437  E3,1437  PHSBB1     ERASE            B(1)PRM
 3016                       E3,1440  E3,1440  PHSNAME2   ERASE            B(1)PRM
 3017                       E3,1441  E3,1441  PHSBB2     ERASE            B(1)PRM
 3018                       E3,1442  E3,1442  PHSNAME3   ERASE            B(1)PRM
 3019                       E3,1443  E3,1443  PHSBB3     ERASE            B(1)PRM
 3020                       E3,1444  E3,1444  PHSNAME4   ERASE            B(1)PRM
 3021                       E3,1445  E3,1445  PHSBB4     ERASE            B(1)PRM
 3022                       E3,1446  E3,1446  PHSNAME5   ERASE            B(1)PRM
 3023                       E3,1447  E3,1447  PHSBB5     ERASE            B(1)PRM
 3024                       E3,1450  E3,1450  PHSNAME6   ERASE            B(1)PRM
 3025                       E3,1451  E3,1451  PHSBB6     ERASE            B(1)PRM

R3026           IMU COMPENSATION PARAMETERS.                                (22D)

 3028                       E3,1452  E3,1452  PBIASX     ERASE            B(1)  PIPA BIAS, PIPA SCALE FACTR TERMS
 3029  REF  1               E3,1452           PIPABIAS   =      PBIASX          INTERMIXED.
 3030                       E3,1453  E3,1453  PIPASCFX   ERASE
 3031  REF  1               E3,1453           PIPASCF    =      PIPASCFX
 3032                       E3,1454  E3,1454  PBIASY     ERASE
 3033                       E3,1455  E3,1455  PIPASCFY   ERASE
 3034                       E3,1456  E3,1456  PBIASZ     ERASE
 3035                       E3,1457  E3,1457  PIPASCFZ   ERASE

 3036                       E3,1460  E3,1460  NBDX       ERASE            GYRO BIAS DRIFTS
 3037  REF  1               E3,1460           GBIASX     =      NBDX
 3038                       E3,1461  E3,1461  NBDY       ERASE
```

```
 3039                          E3,1462  E3,1462   NBDZ      ERASE
 3040                          E3,1463  E3,1463   ADIAX     ERASE          ACCELERATION SENSITIVE DRIFT ALONG THE
 3041                          E3,1464  E3,1464   ADIAY     ERASE              INPUT AXIS
 3042                          E3,1465  E3,1465   ADIAZ     ERASE
 3043                          E3,1466  E3,1466   ADSRAX    ERASE          ACCELERATION SENSITIVE DRIFT ALONG THE
 3044                          E3,1467  E3,1467   ADSRAY    ERASE              SPIN REFERENCE AXIS
 3045                          E3,1470  E3,1470   ADSRAZ    ERASE
 3046                          E3,1471  E3,1476   GCOMP     ERASE  +5       CONTAINS COMPENSATING TORQUES
 3047                          E3,1477  E3,1477   GCOMPSW   ERASE
 3048  REF   1                 E3,1471            COMMAND   EQUALS GCOMP
 3049  REF   2  LAST   82      E3,1474            CDUIND    EQUALS GCOMP   +3

R3050          STATE VECTORS FOR ORBIT INTEGRATION.                        (44D)

R3052                                (DIFEQCNT THRU XKEP MUST BE IN SAME
R3053                                  EBANK AS RRECTCSM, RRECTLEM ETC
R3054                                  BECAUSE THE COPY-CYCLES (ATOPCSM,
R3055                                  PTOACSM ETC) ARE EXECUTED IN BASIC.
R3056                                   ALL OTHER REFERENCES TO THIS GROUP
R3057                                  ARE BY INTERPRETIVE INSTRUCTIONS.)

 3058                          E3,1500  E3,1553   DIFEQCNT  ERASE  +43D      B(1)TMP
R3059                                (UPSVFLAG...XKEP MUST BE KEPT IN ORDER)

 3060  REF   1                 E3,1501            UPSVFLAG  EQUALS DIFEQCNT +1   B(1)PRM UPDATE FLAG
 3061  REF   1                 E3,1502            RRECT     EQUALS UPSVFLAG +1   B(6)TMP POS AT RECT          KM*2(-14)
 3062  REF   1                 E3,1510            VRECT     EQUALS RRECT    +6   B(6)TMP VEL AT RECT      KM(-1/2)*2(6)
 3063  REF   1                 E3,1516            TET       EQUALS VRECT    +6   B(2)TMP TIME OF STATE VECT  CSECS*2(-28)
 3064  REF   1                 E3,1520            TDELTAV   EQUALS TET      +2   B(6)TMP POSITION DEVIATION   KM*2(14)
 3065  REF   1                 E3,1526            TNUV      EQUALS TDELTAV  +6   B(6)TMP VEL DEVIATION    KM(-1/2)*2(14)
 3066  REF   1                 E3,1534            RCV       EQUALS TNUV     +6   B(6)TMP CONIC POSITION      KM*2(-14)
 3068  REF   1                 E3,1542            VCV       EQUALS RCV      +6   B(6)TMP CONIC VELOCITY    KM(-1/2)*2(6)
 3070  REF   1                 E3,1550            TC        EQUALS VCV      +6   B(2)TMP TIME SINCE RECTIFICATION
 3071  REF   1                 E3,1552            XKEP      EQUALS TC       +2   B(2)TMP ROOT OF KEPLER EQ KM(1/2.*2(-10)

R3072          **** TEMP - IN VAC AREA ****
 3073                                0022         RRECT1    EQUALS 18D
 3074                                0030         VRECT1    EQUALS 24D
 3075                                0036         TET1      EQUALS 30D
A3076

R3077          PERMANENT STATE VECTORS AND TIMES.                          (10ID)

R3079          (DO NOT OVERLAY WITH ANYTHING AFTER BOOST)
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R3080           (RRECTCSM ...XKEPCSM MUST BE KEPT IN THIS ORDER)

 3081                       E3,1554  E3,1561  RRECTCSM ERASE  +5          B(6)PRM CSM VARIABLES.
 3082  REF   1              E3,1554           RRECTHIS =      RRECTCSM
 3083                       E3,1562  E3,1567  VRECTCSM ERASE  +5          B(6)PRM
 3084                       E3,1570  E3,1571  TETCSM   ERASE  +1          B(2)PRM
 3085  REF   1              E3,1570           TETTHIS  =      TETCSM
 3086                       E3,1572  E3,1577  DELTACSM ERASE  +5          B(6)PRM
 3087                       E3,1600  E3,1605  NUVCSM   ERASE  +5          B(6)PRM
 3088                       E3,1606  E3,1613  RCVCSM   ERASE  +5          B(6)PRM
 3089                       E3,1614  E3,1621  VCVCSM   ERASE  +5          B(6)PRM
 3090                       E3,1622  E3,1623  TCCSM    ERASE  +1          B(2)PRM
 3091                       E3,1624  E3,1625  XKEPCSM  ERASE  +1          B(2)PRM

R3092           (RRECTLEM ...XKEPLEM MUST BE KEPT IN THIS ORDER)

 3093                       E3,1626  E3,1633  RRECTLEM ERASE  +5          B(6)PRM LEM VARIABLES
 3094  REF   1              E3,1626           RRECTOTH =      RRECTLEM
 3095                       E3,1634  E3,1641  VRECTLEM ERASE  +5          B(6)PRM
 3096                       E3,1642  E3,1643  TETLEM   ERASE  +1          B(2)PRM
 3097  REF   1              E3,1642           TETOTHER =      TETLEM
 3098                       E3,1644  E3,1651  DELTALEM ERASE  +5          B(6)PRM
 3099                       E3,1652  E3,1657  NUVLEM   ERASE  +5          B(6)PRM
 3100                       E3,1660  E3,1665  RCVLEM   ERASE  +5          B(6)PRM
 3101                       E3,1666  E3,1673  VCVLEM   ERASE  +5          B(6)PRM
 3102                       E3,1674  E3,1675  TCLEM    ERASE  +1          B(2)PRM
 3103                       E3,1676  E3,1677  XKEPLEM  ERASE  +1          B(2)PRM

 3104                       E3,1700  E3,1705  X789     ERASE  +5
 3105                       E3,1706  E3,1710  TEPHEM   ERASE         +2
 3106                       E3,1711  E3,1712  AZO      ERASE         +1
 3107                       E3,1713  E3,1720  UNITW    ERASE         +5
 3108  REF   1              E3,1713           -AYO     EQUALS UNITW        (2)
 3109  REF   2  LAST  83    E3,1715           AXO      EQUALS UNITW  +2    (2)
A31095


R3110           STATE VECTORS FOR DOWNLINK.                                (12D)

 3112                       E3,1721  E3,1726  R-OTHER  ERASE  +5          B(6)PRM POS VECT (OTHER VECH) FOR DNLINK
 3113                       E3,1727  E3,1734  V-OTHER  ERASE  +5          B(6)PRM VEL VECT (OTHER VECH) FOR DNLINK

 3114  REF   2  LAST  83    E3,1642           T-OTHER  =      TETLEM                  TIME (OTHER VECH) FOR DNLINK


R3115           REFSMMAT.                                                  (18D)

 3117                       E3,1735  E3,1756  REFSMMAT ERASE  +17D         I(18D)PRM
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R3118           AVERAGEG INTEGRATOR STORAGE.                                (8D)

 3120                       E3,1757  E3,1764   UNITR    ERASE  +5
 3121                       E3,1765  E3,1766   RMAG     ERASE  +1


R3126         **** CONICSEX (PLANETARY INERT. ORIEN.) ****

 3127   REF   1             E3,1706            TIMSUBO  EQUALS TEPHEM          CSEC B-42 (TRIPLE PREC)
 3128   REF   1             E3,1767            END-E3   EQUALS RMAG     +2     NEXT UNUSED E3 ADDRESS
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P4000                   EBANK=4 ASSIGNMENTS

 4001                       E4,1400                  SETLOC 2000

R4002           P20 STORAGE.            -PAD LOADED-                    (4D)

 4004                       E4,1400  E4,1400   WRENDPOS ERASE           B(1)PL          M B-14
 4005                       E4,1401  E4,1401   WRENDVEL ERASE           B(1)PL          M/CSECBO
 4006                       E4,1402  E4,1402   RMAX     ERASE           B(1)PL          METERS*2(-19)
 4007                       E4,1403  E4,1403   VMAX     ERASE           B(1)PL          M/CSEC*2(-7)

R4008           P22 STORAGE.            -PAD LOADED-                    (5D)

 4010                       E4,1404  E4,1404   WORBPOS  ERASE           B(1)PL          M B-14
 4011                       E4,1405  E4,1405   WORBVEL  ERASE           B(1)PL          M/CSECBO
 4012                       E4,1406  E4,1406   S22WSUBL ERASE           B(1)PL          M B-14
 40125                      E4,1407  E4,1410   RPVAR    ERASE     +1    B(2)PL

R4013           CONISEX STORAGE.        -PAD LOADED-                    (6D)

 4015                       E4,1411  E4,1416   504LM    ERASE     +5    I(6)MOON LIBRATION VECTOR
A4016

R4017           ENTRY STORAGE.          -PAD LOADED-                    (2D)

 4019                       E4,1417  E4,1420   EMSALT   ERASE  +1       I(2)PL

R4020           P35 CONSTANTS.          -PAD LOADED-                    (4D)

 4022                       E4,1421  E4,1422   ATIGINC  ERASE  +1       B(2)PL
 4023                       E4,1423  E4,1424   PTIGINC  ERASE  +1       B(2)PL

R40341          LUNAR LANDING SIGHT DATA. -PAD LOADED-                  (6D)
R40342          (USED BY INTEGRATION INITIALIZATION,LAT-LONG SUBROUTINES, P30'S)

 40343                      E4,1425  E4,1432   RLS      ERASE     +5    I(6) PL  LUNAR LANDING SIGHT VECTOR
A40345

R4035   CONISEX (LUNAR AND SOLAR EPHEM)STORAGE. -PAD LOADED-               (77D)

 4037                       E4,1433  E4,1547   TIMEMO   ERASE     +76D
 4038   REF   1             E4,1436            VECOEM   EQUALS TIMEMO +3
 4039   REF   1             E4,1532            RESO     EQUALS VECOEM +60D
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4040    REF   1                 E4,1540           VESO      EQUALS RESO +6
4041    REF   1                 E4,1546           OMEGAES   EQUALS VESO +6

R4043           FLLL INTEGRATION STORAGE.                                    (95D)

4045                            E4,1550  E4,1550  PBODY     ERASE                 I(1)
4046    REF   1                 E4,1551           ALPHAV    EQUALS PBODY    +1    I(6)TMP
4047    REF   1                 E4,1557           BETAV     EQUALS ALPHAV   +6    I(6)TMP
4048    REF   1                 E4,1565           PHIV      EQUALS BETAV    +6    I(6)TMP
4049    REF   1                 E4,1573           PSIV      EQUALS PHIV     +6    I(6)TMP
4050    REF   1                 E4,1601           FV        EQUALS PSIV     +6    I(6)TMP
4051    REF   1                 E4,1607           BETAM     EQUALS FV       +6    I(6)TMP
4052    REF   1                 E4,1611           H         EQUALS BETAM    +2    I(2)TMP
4053    REF   1                 E4,1613           GMODE     EQUALS H        +2    I(1)TMP
4054    REF   1                 E4,1614           IRETURN   EQUALS GMODE    +1    I(1)TMP
4055    REF   1                 E4,1615           NORMGAM   EQUALS IRETURN  +1    I(1)TMP
4056    REF   1                 E4,1616           VECTAB    EQUALS NORMGAM  +1    I(36)TMP
4057    REF   1                 E4,1662           RPQV      EQUALS VECTAB   +36D   (6)TMP VECTOR PRIMARY TO SECONDARY BODY
4058    REF   1                 E4,1670           ORIGEX    EQUALS RPQV     +6    B(1)TMP QSAVE FOR COORD. SWITCH. ROUTINE
4059    REF   1                 E4,1670           KEPRTN    EQUALS ORIGEX           QSAVE FOR KEPLER
4060    REF   2  LAST   86      E4,1671           RQVV      EQUALS ORIGEX   +1    (6)     SEC.BODY TO VEH.VETOR(USED P23)
4061    REF   1                 E4,1677           RPSV      EQUALS RQVV     +6    (6)TMP SUN TO PRIMARY BODY VECTOR
4062    REF   1                 E4,1705           XKEPNEW   EQUALS RPSV     +6    (2)TMP ROOT OF KEPLERS EQU FOR TIME TAU

R4064           THESE PROBABLY CAN SHARE INTEGRATION VARIABLES.                (9D)

4066    REF   2  LAST   86      E4,1624           VACX      EQUALS VECTAB   +6    I(2)TMP
4067    REF   1                 E4,1626           VACY      EQUALS VACX     +2    I(2)TMP
4068    REF   1                 E4,1630           VACZ      EQUALS VACY     +2    I(2)TMP

4069    REF   3  LAST   86      E4,1640           ERADM     EQUALS VECTAB   +18D   I(2)TMP
4070    REF   1                 E4,1642           INCORPEX  EQUALS ERADM    +2    I(1)TMP

R4071           R31(V83) STORAGE. -SHARES WITH INTEGRATION STORAGE-            (28D)
A4074

4075    REF   4  LAST   86      E4,1624           BASEOTP   EQUALS VECTAB   +6    I(6)    BASE PCS VECTOR OTHER VEH
4076    REF   5  LAST   86      E4,1640           BASEOTV   EQUALS VECTAB   +18D   I(6)    BASE VEL VECTOR OTHER VEH
4077    REF   6  LAST   86      E4,1654           BASETHP   EQUALS VECTAB   +30D   I(6)    BASE PCS VECTOR THIS VEH
4078    REF   2  LAST   86      E4,1662           BASETHV   EQUALS RPQV            I(6)    BASE VEL VECTOR THIS VEH
4079    REF   2  LAST   86      E4,1671           BASETIME  EQUALS RQVV            I(2)    TIME ASSOC WITH BASE VECS
4080    REF   3  LAST   86      E4,1673           ORIG      EQUALS RQVV     +2    I(1)    =0 FOR EARTH =+2 FOR MOON
4081    REF   4  LAST   86      E4,1674           STATEXIT  EQUALS RQVV     +3    I(1)    STQ ADDRESS FOR STATEXTP

R4082           CONIC INTEGRATION STORAGE.    -MAY NOT SHARE WITH SERVICER-    (6D)
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 4085   REF   1            E4,1707          ALPHAM   EQUALS XKEPNEW  +2     I(2)TMP
 4086   REF   1            E4,1711          TAU.     EQUALS ALPHAM   +2     I(2)TMP
 4088   REF   1            E4,1713          DT/2     EQUALS TAU.     +2     I(2)TMP

R4089           P21 STORAGE.                                                (20)

 4091   REF   1            E4,1715          P21TIME  EQUALS DT/2     +2     B(2) TMP
A4092

R4093           INCORPORATION/VERB 83 COMMON STORAGE.                       (10)

 4095   REF   1            E4,1717          EGRESS   EQUALS P21TIME  +2     I(1)TMP SAVES RETURNS.

R4096           VERB 83 STORAGE.      MAY SHARE ONLY WITH INCORPORATION.    (18D)

 4098   REF   1            E4,1720          RANGE    EQUALS EGRESS   +1     I(2)DSP NOUN 54 DISTANCE TO OPTICAL SUBJ
 4099   REF   1            E4,1722          RRATE    EQUALS RANGE    +2     I(2)DSP NOUN 54 RATE OF APPROACH
 4100   REF   1            E4,1724          RTHETA   EQUALS RRATE    +2     I(2)DSP NOUN 54
 4101   REF   1            E4,1726          RONE     EQUALS RTHETA   +2     I(6)TMP VECTOR STORAGE. (SCRATCH)
 4102   REF   1            E4,1734          VONE     EQUALS RONE     +6     I(6)TMP VECTOR STORAGE. (SCRATCH)

R4103           LUNAR LANDMARK SELECTION PROGRAM - R35                      (28D)

 4105   REF   2  LAST  87  E4,1720          XR1HOLD  EQUALS RANGE            I(2)
 4106   REF   1            E4,1722          VECTIME  EQUALS XR1HOLD  +2     I(2)
 4107   REF   1            E4,1724          JLOOPCNT EQUALS VECTIME  +2     I(1)
 4108   REF   1            E4,1725          KLOOPCNT EQUALS JLOOPCNT +1     I(1)
 4109   REF   1            E4,1726          NKVAL    EQUALS KLOOPCNT +1     I(1)
 4110   REF   1            E4,1727          DELTAL   EQUALS NKVAL    +1     I(2)
 4111   REF   1            E4,1731          TK       EQUALS DELTAL   +2     I(2)
 4112   REF   1            E4,1733          INDEXNUM EQUALS TK       +2     I(1)

 4113   REF   1            E4,1734          LONGSAVE EQUALS INDEXNUM +1     I(2)
 4114   REF   1            E4,1736          POSVECT  EQUALS LONGSAVE +2     I(6)
 4115   REF   1            E4,1744          VELVECT  EQUALS POSVECT  +6     I(6)
 4116   REF   1            E4,1752          LSLONG   EQUALS VELVECT   +6    I(2) TMP LONGITUDE OF LANDING SIGHT

R4117           S-BAND ANTENNA GIMBAL ANGLES.  DISPLAYED BY R05 (EXT.VB.64) (4D)
R4119                 OPERATION DURING P00 ONLY.

 4120   REF   3  LAST  87  E4,1720          RHOSB    EQUALS RANGE            B(2)DSP NOUN 51.  PITCH ANGLE
 4121   REF   1            E4,1722          GAMMASB  EQUALS RHOSB    +2     B(2)DSP NOUN 51.  YAW ANGLE

R4122           R 36 SCRATCHPAD STORAGE                                     (12)
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 4124   REF   2  LAST   87   E4,1726          RPASS36  EQUALS RONE             I (6)S-S
 4125   REF   1               E4,1734          UNP36    EQUALS RPASS36  +6      I (6)S-S
A4126


R4127            EXTENDED VERB 82 STORAGE.

R4128            (*** THE SHARING IN THIS SECTION IS TEMPORARY ONLY****)        (8D)

 4130   REF   4  LAST   87   E4,1720          HPERMIN  EQUALS RANGE            I(2) SET TO 300KFT OR 35KFT FOR SR30.1
 4131   REF   1               E4,1722          RPADTEM  EQUALS HPERMIN  +2      I(2) PAD OR LANDING RADIUS FOR SR30.1
 4132   REF   1               E4,1724          TSTART82 EQUALS RPADTEM  +2      I(2) TEMP TIME STORAGE FOR V82.
A4133


R4134            MORE VERB 82 NOT SHARING WITH VERB 83                          (9D)


 4136   REF   1               E4,1742          V82FLAGS EQUALS VONE     +6       (1) FOR V 82 BITS
 4137   REF   1               E4,1743          TFF      EQUALS V82FLAGS +1      I(2) DSP NOUN 42,   , FOR P30,40,41.
 4138   REF   1               E4,1745          -TPER    EQUALS TFF      +2      I(2)DSP NOUN 32
 4139   REF   1               E4,1747          THETA(1) EQUALS -TPER    +2      I(2) TMP SET AT END OF V82
 4140   REF   1               E4,1755          RSP-RREC EQUALS AOPTIME          DSP NOUN R32


R4141            REENTRY CONICS                                                 (6D)

 4143   REF   2  LAST   88   E4,1742          URONE    EQUALS V82FLAGS         I(6) SAVE ACTUAL FOR CALCULATIONS
A4144


R4145            V 82 DISPLAY                                                   (4D)

 4147   REF   1               E4,1751          HAPOX    EQUALS THETA(1) +2      I(2) DSP NOUN 44
 4148   REF   1               E4,1753          HPERX    EQUALS HAPOX    +2      I(2) DSP NOUN 44
A4149


R4154            VARIOUS DISPLAY REGISTERS.                                     (06D)

 4156   REF   1               E4,1755          AOPTIME  EQUALS HPERX    +2
 4157   REF   2  LAST   88   E4,1757          LANDLONG EQUALS AOPTIME  +2      I(2) DSP NOUN 89 FOR P22
 4158   REF   1               E4,1761          LANDALT  EQUALS LANDLONG +2      I(2)DSP NOUN 89 FOR P22.
R4159


R4160            S34/35.5,P34-P35 STORAGE.                                      (6D)

 4162   REF   1               E4,1763          KT       EQUALS LANDALT  +2      B(2)
 4163   REF   1               E4,1765          VERBNOUN EQUALS KT       +2      B(1)TMP
 4164   REF   1               E4,1766          QSAVED   EQUALS VERBNOUN +1      B(1)TMP HOLDS RETURN
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 4165   REF   1              E4,1767          RTRN     EQUALS QSAVED   +1     B(1) RETURN
 4166   REF   1              E4,1770          SUBEXIT  EQUALS RTRN     +1     B(1) TMP
A4167                                                                         RGEXIT CANT SHARE WITH HPER,HAPO
 4168   REF   1              E4,1770          RGEXIT   EQUALS SUBEXIT         I(1)TMP Q SAVE MODE 1 AND 2 TO RTRN MAIN

R4169          P 30 DISPLAY                                                   (4D)

 4171   REF   2 LAST  88    E4,1763          HAPO     EQUALS KT              I(2) DSP NOUN 42, FOR P30.
 4172   REF   1              E4,1765          HPER     EQUALS HAPO     +2     I(2) DSP NOUN 42, FOR P30.
A4173

R4174          SOME P34 STORAGE.      (OVERLAYS P35.1 STORAGE)                (2D)

 4176   REF   3 LAST  89    E4,1763          NOMTPI   EQUALS KT              I(2)TMP NOMINAL TPI TIME FOR RECYCLE

R4177   THE FOLLOWING ARE ERASABLES USED BY THE SYSTEM TESTS. 205 USES TRANSM1  GS ARE NOT USED IN 205 NOR ARE THEY
R4179   WHILE 504 USES TRANSM1 AND ALFOK .

 4180                        E4,1400          TRANSM1  EQUALS 2000             (18) INITIALIZATION FOR IMU TESTS
 4181   REF   1              E4,1422          ALFOK    =       TRANSM1 +18D    (144) ERASABLE LOAD IN 504
R4182   END OF PERF. TEST ERASABLE IN BANK 4

R4183        *-*-* V82 *-*-*                                                   (6D)

 4185   REF   1              E4,1771          VONE'    EQUALS RGEXIT   +1     I(6)TMP NORMAL VELOCITY VONE/ SQ RT MU
A4186

R4187          PAD LOAD INTEGRATION ERROR INCLUDED IN VARIANCE BY P20          (1D)

 4188   REF   1              E4,1777          INTVAR   EQUALS VONE'    +6     I(1)PL  SQUARE OF EXPECTED INTEGRATION
A4189                                                                                  POSITION EXTRAPOLATION ERROR.
A4190                                                                                  SCALED  METERS(2) 2(15)

 4191   REF   1              E4,1777          END-E4   EQUALS INTVAR          LAST USED ERASABLE IN E4
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P5000   EBANK-5 ASSIGNMENTS
 5001                       E5,1400                  SETLOC 2400

R5002            *-*-*-*-  OVERLAY 1 IN EBANK 5 -*-*-*-*

R5003            W-MATRIX STORAGE.                                          (162D)

 5005                       E5,1400          W       EQUALS 2400           B(162)

 5006   REF   1             E5,1570          EMATRIX =      W       +120D  B(42E    USED TO CONVERT W TO  6X6
 5007   REF   2 LAST  90    E5,1642          END-W   EQUALS W       +162D  **NEXT AVAILABLE LOC AFTER W MATRIX**

R5008            ALTO-OPTICS STORAGE -R52-

R5009   DO NOT MOVE FROM E5,1554. A DELICATE BALANCE EXISTS BETWEEN THIS AND P03
 5010   REF   3 LAST  90    E5,1554          XNB1    EQUALS W       +108D  B(6D) TMP
 5011   REF   1             E5,1562          YNB1    EQUALS XNB1    +6     B(6)TMP
 5012   REF   1             E5,1570          ZNB1    EQUALS YNB1    +6     B(6)TMP
 5013   REF   1             E5,1576          SAVQR52 EQUALS ZNB1    +6     I(2)TMP
 5014   REF   1             E5,1600          PLANVEC EQUALS SAVQR52 +2     B(6) S-S SIGHTING VECTOR IN REF. COOR.
 5015   REF   1             E5,1606          TSIGHT  EQUALS PLANVEC +6     B(2) S-S TIME OF SIGHTING
A5016

R50165           RENDEZVOUS -P34-35                                         (26D)

 5018   REF   1             E5,1610          DVLOS   EQUALS TSIGHT  +2     I(6) S-S DELTA VELOCITY,LOS COORD-DISPL
 5019   REF   1             E5,1610          DELTAR  EQUALS DVLOS          I(2)
 5020   REF   1             E5,1610          TINTSOI EQUALS DELTAR         I(2) INTERCEPT TIME FOR  SOI MANEUVER
 50205  REF   2 LAST  90    E5,1612          DELTTIME EQUALS DVLOS  +2     I(2)
 5021   REF   3 LAST  90    E5,1614          TARGTIME EQUALS DVLOS  +4     I(2)
 5022   REF   4 LAST  90    E5,1616          UNRM    EQUALS DVLOS   +6     I(6) S-S
 5023   REF   1             E5,1624          ULOS    EQUALS UNRM    +6     I(6) S-S UNIT LINE OF SIGHT VECTOR
 5024   REF   1             E5,1632          ACTCENT EQUALS ULOS    +6     I(2) S-S CENTRAL ANGLE BETWEEN ACTIVE
A5025                                                                              VEH AT TPI IGNITION TIME AND
A5026                                                                              TARGET VECTOR.
 5027   REF   1             E5,1634          DELVTPI EQUALS ACTCENT +2     I(2)    NOUN 58 FOR P34.
 5028   REF   1             E5,1636          DELVTPF EQUALS DELVTPI +2     I(2)    NOUN 58,59 FOR P34,35.
 5029   REF   1             E5,1640          POSTTPI EQUALS DELVTPF +2     I(2)    NOUN 58 FOR P34.
 5030   REF   2 LAST  90    E5,1634          TDEC2   EQUALS DELVTPI         (2)

R5031            ALIGNMENT                                                  (12D)

 5033   REF   5 LAST  90    E5,1610          STARSAV1 EQUALS DVLOS          I(6)TMP RESTART STAR SAVE.
 5034   REF   1             E5,1616          STARSAV2 EQUALS STARSAV1 +6    I(6)TMP RESTART STAR SAVE.
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5035 REF 1 E5,1616 US = STARSAV2 (CISLUNAR TAG FOR STARSAV2).
A5036

R5037 TPI SEARCH (26D)

5039 REF 6 LAST 9C E5,1610 IT EQUALS DVLOS (6)
5040 REF 1 E5,1616 THETZERO EQUALS IT +6 (2)
5041 REF 1 E5,1620 TFI EQUALS THETZERO +2 (2)
5042 REF 1 E5,1622 DELVEE EQUALS TFI +2 (2)
5043 REF 1 E5,1624 HP EQUALS DELVEE +2 (2)
5044 REF 1 E5,1626 TFO EQUALS HP +2 (2)
5045 REF 1 E5,1630 HPO EQUALS TFO +2 (2)
5046 REF 1 E5,1632 DELVEC EQUALS HPO +2 (2)
5047 REF 1 E5,1634 MAGVTPI EQUALS DELVEC +2 I(2) TMP MAG OF DELTAVTPI OR VMID
5048 REF 1 E5,1636 RELDELV EQUALS MAGVTPI +2 I(2) TMP MAG OF DELTAVTPF
5049 REF 1 E5,1640 T3TOT4 EQUALS RELDELV +2 I(2) DSP NOUN 39 FOR P34, 35. TPI TO TIN
A5049J T (CAN NOT SHARE WITH RETURN TO EARTH)

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P5050           ALIGNMENT/SYSTEST/CALCSMSC/CRS61.1 COMMON STORAGE.          (36D)
R5052           (CALCSMSC IS A SUBSET OF S41.1 AT LEAST)
R5053           (CRS61.1  IS A SUBSET OF P20)

 5054  REF  1            E5,1671     XSM     EQUALS END-W   +23D   B(6)
 5055  REF  1            E5,1677     YSM     EQUALS XSM     +6     B(6)TMP
 5056  REF  1            E5,1705     ZSM     EQUALS YSM     +6     B(6)TMP

 5057  REF  1            E5,1713     XDC     EQUALS ZSM     +6     B(6)TMP
 5058  REF  1            E5,1721     YDC     EQUALS XDC     +6     B(6)TMP
 5059  REF  1            E5,1727     ZDC     EQUALS YDC     +6     B(6)TMP

 5060  REF  2 LAST  92   E5,1713     XNB     =      XDC
 5061  REF  2 LAST  92   E5,1721     YNB     =      YDC
 5062  REF  1            E5,1727     ZNB     =      ZDC


R5063           OVERLAYS WITHIN ALIGNMENT/SYSTEST/CALCSMSC COMMON STORAGE.

 5064  REF  2 LAST  92   E5,1673     -COSB   EQUALS XSM     +2     (2)TMP
 5065  REF  1            E5,1675     SINB    EQUALS -COSB   +2     (2)TMP


R5066           ALIGNMENT/SYSTEST COMMON STORAGE.                           (18D)

 5068  REF  2 LAST  92   E5,1735     STARAD  EQUALS ZDC     +6     I(18D)TMP

R5069           ALIGNMENT/SYSTEST/AUTO OPTICS COMMON STORAGE.               (17D)

 5071  REF  1            E5,1757     OGC     EQUALS STARAD  +18D   I(2)TMP
 5072  REF  1            E5,1761     IGC     EQUALS OGC     +2     I(2)TMP
 5073  REF  1            E5,1763     MGC     EQUALS IGC     +2     I(2)TMP
 5074  REF  1            E5,1765     STAR    EQUALS MGC     +2     I(6)TMP
 5075  REF  1            E5,1773     SAC     EQUALS STAR    +6     I(2)TMP
 5076  REF  1            E5,1775     PAC     EQUALS SAC     +2     I(2)TMP
 5077  REF  1            E5,1777     QMIN    EQUALS PAC     +2     B(1)TMP
R5078

R5079           **** CCLP50$ ****                                           (1D)

 5081  REF  1            E5,1735     CULTRIX EQUALS VEARTH          VEARTH, VSUN, VMOON


R5082           OVERLAYS WITHIN ALIGNMENT/SYSTEST COMMON STORAGE.           (24D)

 5084  REF  2 LAST  92   E5,1735     VEARTH  EQUALS STARAD          (6)TMP
 5085  REF  2 LAST  92   E5,1743     VSUN    EQUALS VEARTH  +6      (6)TMP
 5086  REF  1            E5,1751     VMOON   EQUALS VSUN    +6      (6)TMP
 5087  REF  1            E5,1757     SAX     EQUALS VMOON   +6      (6)TMP
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P5088 *-*-*-*- OVERLAY 2 IN EBANK 5 -*-*-*-*

R5089 CONIC ROUTINES STORAGE. (87D)

```
5091  REF  2  LAST  92   E5,1642   DELX      EQUALS END-W          I(2)TMP
5092  REF  1             E5,1644   DELT      EQUALS DELX     +2    I(2)TMP
5093  REF  1             E5,1646   URRECT    EQUALS DELT     +2    I(6)TMP
5094  REF  1             E5,1654   RCNORM    EQUALS URRECT   +6    I(2)TMP
5095  REF  1             E3,1552   XPREV     EQUALS XKEP           I(2)TMP
5096  REF  1             E5,1656   R1VEC     EQUALS RCNORM   +2    I(6)TMP
5097  REF  1             E5,1664   R2VEC     EQUALS R1VEC    +6    I(6)TMP
5098  REF  1             E5,1672   TDESIRED  EQUALS R2VEC    +6    I(2)TMP
5099  REF  1             E5,1674   GEOMSGN   EQUALS TDESIRED +2    I(1)TMP
5100  REF  1             E5,1675   UN        EQUALS GEOMSGN  +1    I(6)TMP
5101  REF  1             E5,1703   VTARGTAG  EQUALS UN       +6    I(1)TMP
5102  REF  1             E5,1704   VTARGET   EQUALS VTARGTAG +1    I(6)TMP
5103  REF  1             E5,1712   RTNLAMB   EQUALS VTARGET  +6    I(1)TMP
5104  REF  1             E5,1713   U2        EQUALS RTNLAMB  +1    I(6)TMP
5105  REF  1             E5,1721   MAGVEC2   EQUALS U2       +6    I(2)TMP
5106  REF  1             E5,1723   UR1       EQUALS MAGVEC2  +2    I(6)TMP
5107  REF  1             E5,1731   SNTH      EQUALS UR1      +6    I(2)TMP
5108  REF  1             E5,1733   CSTH      EQUALS SNTH     +2    I(2)TMP
5109  REF  1             E5,1735   1-CSTH    EQUALS CSTH     +2    I(2)TMP
5110  REF  1             E5,1737   CSTH-RHO  EQUALS 1-CSTH   +2    I(2)TMP
5111  REF  1             E5,1741   P         EQUALS CSTH-RHO +2    I(2)TMP
5112  REF  1             E5,1743   R1A       EQUALS P        +2    I(2)TMP
5113  REF  2  LAST  93   E5,1656   RVEC      EQUALS R1VEC          I(6)TMP
5114  REF  1             E5,1745   VVEC      EQUALS R1A      +2    I(6)TMP
5115  REF  2  LAST  93   E5,1712   RTNTT     EQUALS RTNLAMB        I(1)TMP
5116  REF  1             E5,1753   ECC       EQUALS VVEC     +6    I(2)TMP
5117  REF  3  LAST  93   E5,1712   RTNTR     EQUALS RTNLAMB        I(1)TMP
5118  REF  4  LAST  93   E5,1712   RTNAPSE   EQUALS RTNLAMB        I(1)TMP
5119  REF  2  LAST  93   E5,1721   R2        EQUALS MAGVEC2        I(2)TMP
5120  REF  1             E5,1755   RTNPRM    EQUALS ECC      +2    I(1)TMP
5121  REF  1             E5,1756   SGNRDOT   EQUALS RTNPRM   +1    I(1)TMP
5122  REF  1             E5,1757   RDESIRED  EQUALS SGNRDOT  +1    I(2)TMP
5123  REF  1             E5,1761   DELDEP    EQUALS RDESIRED +2    I(2)TMP
5124  REF  1             E5,1763   DEPREV    EQUALS DELDEP   +2    I(2)TMP
5125  REF  2  LAST  93   E5,1761   TERRLAMB  EQUALS DELDEP         I(2)TMP
5126  REF  1             E5,1763   TPREV     EQUALS DEPREV         I(2)TMP
A5127
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P5128                *-*-*-*-  OVERLAY 3 IN EBANK 5 -*-*-*-*

R5129                MEASUREMENT INCORPORATION STORAGE.                          (66D)
R5131                (CALLED BY P20, P22, P23)

 5132  REF   3  LAST  93   E5,1642    OMEGAM1  EQUALS END-W          I(6)TMP
 5133  REF   1             E5,1650    OMEGAM2  EQUALS OMEGAM1  +6    I(6)TMP
 5134  REF   1             E5,1656    OMEGAM3  EQUALS OMEGAM2  +6    I(6)TMP
 5135  REF   1             E5,1664    HOLDW    EQUALS OMEGAM3  +6    I(18)TMP
 5136  REF   1             E5,1706    TDPOS    EQUALS HOLDW    +18D  I(6)TMP
 5137  REF   1             E5,1714    TDVEL    EQUALS TDPOS    +6    I(6)TMP

 5138  REF   1             E5,1722    ZI       EQUALS TDVEL    +6    I(18)

R5140                P22-P23 STORAGE.                                           (8D)

 5143  REF   1             E5,1744    22SUBSCL EQUALS ZI       +18D  DE OF ABCDE LANDMARK ID NO.
 5144  REF   1             E5,1745    CXOFF    EQUALS 22SUBSCL +1    B OF ABCDE OFFSET INDICATOR
 5145  REF   1             E5,1746    8KK      EQUALS CXOFF    +1    B(1)TMP INDEX OF PRESENT MARK.
 5146  REF   1             E5,1747    8NN      EQUALS 8KK      +1    B(1)TMP
 5147  REF   1             E5,1750    S22LOC   EQUALS 8NN      +1    I(1)TMP MARK DATA LOC
 5148  REF   1             E5,1751    LANDMARK EQUALS S22LOC   +1    B(1)DSP NOUN 70 FOR P22,51, R52,53.
 5149  REF   1             E5,1752    HORIZON  EQUALS LANDMARK +1    B(1)DSP NOUN 70 FOR P22,51, R52,53.
 5150  REF   1             E5,1753    IDOFLMK  EQUALS HORIZON  +1    B(1)
R5151

R5152                ******P23***                                               (1D)
 5155  REF   1             E5,1754    TRUNION  EQUALS IDOFLMK  +1    B(1)
A5156
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P5157           *-*-*-*-  OVERLAY 0 IN EBANK 5 -*-*-*-*

R5158           SYSTEM TEST STORAGE.                                    (174)

 5160                       E5,1400  E5,1401   AZIMUTH  ERASE  +1
 5161                       E5,1402  E5,1403   LATITUDE ERASE  +1

 5162  REF   1                1160             TRUNA    EQUALS DESOPTT
 5163  REF   1                1161             SHAFTA   EQUALS DESOPTS

 5164                       E5,1404  E5,1411   ERVECTOR ERASE  +5
 5165                       E5,1412  E5,1412   LENGTHOT ERASE
 5166                       E5,1413  E5,1420   LOSVEC   ERASE  +5

 5167  REF   1              E5,1413             SXTOPTN  =      LOSVEC
 5168                       E5,1421  E5,1421   NDXCTR   ERASE
 5169                       E5,1422  E5,1422   PIPINDEX ERASE
 5170                       E5,1423  E5,1423   POSITON  ERASE
 5171                       E5,1424  E5,1424   QPLAC    ERASE
 5172                       E5,1425  E5,1425   QPLACE   ERASE
 5173                       E5,1426  E5,1426   QPLACES  ERASE
 5174                       E5,1427  E5,1427   RUN      ERASE
 5175                       E5,1430  E5,1430   STOREPL  ERASE
 5176                       E5,1431  E5,1431   SOUTHDR  ERASE
 5177  REF   1              E5,1431             TARG1/2  =      SOUTHDR
 5178                       E5,1432  E5,1437   TAZEL1   ERASE  +5
 5179                       E5,1440  E5,1441   TEMPTIME ERASE  +1
 5180                       E5,1442  E5,1443   TMARK    ERASE  +1
 5181                       E5,1444  E5,1652   GENPL    ERASE  +134D
 5182  REF   1              E5,1444             CDUTIMEI =      GENPL
 5183  REF   2  LAST  95    E5,1446             CDUTIMEF =      GENPL +2
 5184  REF   3  LAST  95    E5,1450             IMU/OPT  =      GENPL +4
 5185  REF   4  LAST  95    E5,1451             CDUREADF =      GENPL +5
 5186  REF   5  LAST  95    E5,1452             CDUREADI =      GENPL +6
 5187  REF   6  LAST  95    E5,1453             CDULIMIT =      GENPL +7

 5188  REF   7  LAST  95    E5,1450             TEMPADD  =      GENPL +4
 5189  REF   8  LAST  95    E5,1451             TEMP     =      GENPL +5
 5190  REF   9  LAST  95    E5,1452             NOBITS   =      GENPL +6
 5191  REF  10  LAST  95    E5,1453             CHAN     =      GENPL +7

 5192  REF  11  LAST  95    E5,1454             LOS1     =      GENPL +8D
 5193  REF  12  LAST  95    E5,1462             LOS2     =      GENPL +14D

 5194  REF  13  LAST  95    E5,1470             CALCDIR  EQUALS GENPL +20D
 5195  REF  14  LAST  95    E5,1471             CDUFLAG  EQUALS GENPL +21D
 5196  REF  15  LAST  95    E5,1472             GYTOBETQ EQUALS GENPL +22D
 5197  REF  16  LAST  95    E5,1473             OPTNREG  EQUALS GENPL +23D
 5198  REF  17  LAST  95    E5,1474             SAVE     EQUALS GENPL +24D      THREE CONSEC LOC
 5199  REF  18  LAST  95    E5,1477             SFCONST1 EQUALS GENPL +27D
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5200   REF  19  LAST  95   E5,1500          TIMER    EQUALS GENPL +28D

5201   REF  20  LAST  96   E5,1502          DATAPL   EQUALS GENPL +30D
5202   REF  21  LAST  96   E5,1444          RDSP     EQUALS GENPL          FIX LATER   POSSIBLY KEEP1
5203   REF  22  LAST  96   E5,1544          MASKREG  EQUALS GENPL +64D
5204   REF  23  LAST  96   E5,1546          CDUNDX   EQUALS GENPL +66D
5205   REF  24  LAST  96   E5,1547          RESULTCT EQUALS GENPL +67D
5206   REF  25  LAST  96   E5,1552          COUNTPL  EQUALS GENPL +70D

5207   REF  26  LAST  96   E5,1553          CDUANG   EQUALS GENPL +71D
5208   REF  27  LAST  96   E5,1444          AINLA    =      GENPL          OPTIMUM CALIB. AND ALIGNMENT


5209   REF   1              E5,1444          WANGO    EQUALS AINLA
5210   REF   2  LAST  96   E5,1446          WANGI    EQUALS AINLA +2D
5211   REF   3  LAST  96   E5,1450          WANGT    EQUALS AINLA +4D
5212   REF   1              E5,1450          TORQNDX  =      WANGT
5213   REF   4  LAST  96   E5,1452          DRIFTT   EQUALS AINLA +6D
5214   REF   5  LAST  96   E5,1454          ALXIS    EQUALS AINLA +8D
5215   REF   6  LAST  96   E5,1455          CMPXI    EQUALS AINLA +9D
5216   REF   7  LAST  96   E5,1456          ALK      EQUALS AINLA +10D
5217   REF   8  LAST  96   E5,1472          VLAUNS   EQUALS AINLA +22D
5218   REF   1              E5,1460          THETAX   =      ALK +2
5219   REF   9  LAST  96   E5,1474          WPLATO   EQUALS AINLA +24D
5220   REF  10  LAST  96   E5,1500          INTY     EQUALS AINLA +28D
5221   REF   1              E5,1466          THETAN   =      THETAX +6
5222   REF  11  LAST  96   E5,1502          ANGZ     EQUALS AINLA +30D
5223   REF  12  LAST  96   E5,1504          INTZ     EQUALS AINLA +32D
5224   REF  13  LAST  96   E5,1506          ANGY     EQUALS AINLA +34D
5225   REF  14  LAST  96   E5,1510          ANGX     EQUALS AINLA +36D
5226   REF  15  LAST  96   E5,1512          DRIFTO   EQUALS AINLA +38D
5227   REF  16  LAST  96   E5,1514          DRIFTI   EQUALS AINLA +40D
5228   REF  17  LAST  96   E5,1520          VLAUN    EQUALS AINLA +44D
5229   REF   1              E5,1474          FILDELV  =      THETAN +6
5230   REF  18  LAST  96   E5,1522          ACCWD    EQUALS AINLA +46D
5231   REF   1              E5,1476          INTVEC   =      FILDELV +2
5232   REF  19  LAST  96   E5,1530          POSNV    EQUALS AINLA +52D
5233   REF  20  LAST  96   E5,1532          DPIPAY   EQUALS AINLA +54D
5234   REF  21  LAST  96   E5,1536          DPIPAZ   EQUALS AINLA +58D
5235   REF  22  LAST  96   E5,1540          ALTIM    EQUALS AINLA +60D
5236   REF  23  LAST  96   E5,1541          ALTIMS   EQUALS AINLA +61D
5237   REF  24  LAST  96   E5,1542          ALDK     EQUALS AINLA +62D
5238   REF  25  LAST  96   E5,1560          DELM     EQUALS AINLA +76D
5239   REF  26  LAST  96   E5,1570          WPLATI   EQUALS AINLA +84D
5240   REF  27  LAST  96   E5,1577          RESTARPT =      AINLA + 91D
5241   REF  28  LAST  96   E5,1631          GEOSAVED =      AINLA +117D
5242   REF  29  LAST  96   E5,1632          PREMTRXC =      AINLA +118D
5243   REF  30  LAST  96   E5,1633          LAUNCHAZ =      AINLA +119D
5244   REF  31  LAST  96   E5,1635          NEWAZMTH =      AINLA +121D
5245   REF  32  LAST  96   E5,1637          OLDAZMTH =      AINLA +123D
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5246   REF  33  LAST   96   E5,1641          TOLDAZMT =      AINLA +125D
5247   REF  34  LAST   97   E5,1643          GEOCOMPS =      AINLA +127D
5248   REF  35  LAST   97   E5,1644          1SECXT   =      AINLA +128D
5249   REF  36  LAST   97   E5,1645          GTSWTLST =      AINLA +129D
5250   REF  37  LAST   97   E5,1646          ERECTIME =      AINLA +130D
5251   REF  38  LAST   97   E5,1647          ERCOMP   =      AINLA +131D
5252   REF  39  LAST   97   E5,1655          ZERONDX  =      AINLA +137D
5253   REF   1              E5,1655          GTSCPNDZ =      ZERONDX

R5254  THE FOLLOWING TAGS ARE USED BY THE 504 IMU CALIBRATION AND ALIGNMENT PROGRAM ONLY.

5256   REF   2  LAST   96   E5,1460          THETAX1  EQUALS ALK      +2
5257   REF   1              E5,1466          THETAN1  EQUALS THETAX1  +6
5258   REF   1              E5,1474          FILDELV1 EQUALS THETAN1  +6
5259   REF   1              E5,1476          INTVEC1  EQUALS FILDELV1 +2
5260   REF  40  LAST   97   E5,1631          GEOSAVE1 EQUALS AINLA    +117D
5261   REF  41  LAST   97   E5,1632          PREMTRX1 EQUALS AINLA    +118D
5262   REF  42  LAST   97   E5,1633          LUNCHAZ1 EQUALS AINLA    +119D
5263   REF   1              E5,1635          NEWAZ1   EQUALS LUNCHAZ1 +2
5264   REF   2  LAST   97   E5,1637          OLDAZ1   EQUALS LUNCHAZ1 +4
5265   REF   3  LAST   97   E5,1641          TOLDAZ1  EQUALS LUNCHAZ1 +6
5266   REF  43  LAST   97   E5,1643          GEOCOMP1 EQUALS AINLA    +127D
5267   REF  44  LAST   97   E5,1644          1SECXT1  EQUALS AINLA    +128D
5268   REF  45  LAST   97   E5,1645          GTSWTLT1 EQUALS AINLA    +129D
5269   REF  46  LAST   97   E5,1646          ERECTIM1 EQUALS AINLA    +130D
5270   REF  47  LAST   97   E5,1647          ERCOMP1  EQUALS AINLA    +131D  I(6)
5271   REF  48  LAST   97   E5,1655          ZERONDX1 EQUALS AINLA    +137D
52715  REF  49  LAST   97   E5,1656          PERFDLAY EQUALS AINLA    +138D  B(2).........
R5272  END OF 504 CAL + ALIGN ERASE.

5273   REF   1              E5,1777          END-E5   EQUALS QMIN            LAST USED E5 ADDRESS
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P6000                   EBANK=6 ASSIGNMENTS
 6001                        E6,1400                    SETLOC 3000

R60011          P23   PAD LOADS***                                          (2D).

 60013                  E6,1400  E6,1400   WMIDPOS  ERASE                  I(1) PL  INITIAL VALUES FOR W-MATRIX IN
 60014                  E6,1401  E6,1401   WMIDVEL  ERASE                  I(1) PL  CISLUNAR (P23) NAVIGATION
A60015

R60016          R22 PAD LOADS                                               ( 5D ).

 60018                  E6,1402  E6,1403   RVAR     ERASE          +1      I(2) PL  VHF RADAR
 60019                  E6,1404  E6,1406   RVARMIN  ERASE          +2      I(3) PL  VHF RADAR
A600195

R6002   ******** PAD LOADED ENTRY DAP STEERING VARIABLES ********           (3D)

 6004                   E6,1407  E6,1407   LADPAD   ERASE                  I(1) PL  FOR ENTRY.HOLDS CM  NOMINAL L/D
 6005                   E6,1410  E6,1410   LODPAD   ERASE                  I(1) PL  FOR ENTRY.HOLDS CM  NOMINAL LOD
 6006                   E6,1411  E6,1411   ALFAPAD  ERASE                  B(1) PL  ALFA TRIM / 180
A60062

R6007   ******** PAD LOADED TVC DAP VARIABLES.**********************************(26D)

 6009                   E6,1412  E6,1412   ESTROKER ERASE                  B(1)PL
 6010                   E6,1413  E6,1414   EKPRIME  ERASE          +1      B(2)PL
 6011                   E6,1415  E6,1415   ETDECAY  ERASE                  I(1)PL
 6012                   E6,1416  E6,1417   EKTLX/I  ERASE  +1              B(2)PL
 6013                   E6,1420  E6,1420   ETVCDT/2 ERASE                  B(1)PL
 6014                   E6,1421  E6,1421   ETSWITCH ERASE                  B(1)PL
 6015                   E6,1422  E6,1422   ECORFRAC ERASE                  B(1)PL
 6016                   E6,1423  E6,1424   EREPFRAC ERASE          +1      B(2)PL
 6017                   E6,1425  E6,1425   PACTOFF  ERASE                  B(1)PL, DSP N48 R01 = PTRIM, R02 = YTRIM
 6018                   E6,1426  E6,1426   YACTOFF  ERASE                  B(1)PL, CONSECUTIVE WITH PACTOFF
 6019                   E6,1427  E6,1427   AP0      ERASE                  B(1)
 6020                   E6,1430  E6,1431   AP1      ERASE  +1              B(2)
 6021                   E6,1432  E6,1433   AP2      ERASE  +1              B(2)
 6022                   E6,1434  E6,1435   AP3      ERASE  +1              B(2)

 6023                   E6,1436  E6,1437   BP1      ERASE  +1              B(2)
 6024                   E6,1440  E6,1441   BP2      ERASE  +1              B(2)
 6025                   E6,1442  E6,1443   BP3      ERASE  +1              B(2)
 6027   REF   1         E6,1427            AY0      =      AP0
 6028   REF   1         E6,1430            AY1      =      AP1
 6029   REF   1         E6,1432            AY2      =      AP2
 6030   REF   1         E6,1434            AY3      =      AP3

 6031   REF   1         E6,1436            BY1      =      BP1
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 6032   REF   1            E6,1440          BY2      =       BP2
 6033   REF   1            E6,1442          BY3      =       BP3

R6034   ******** EXCLUSIVE TVC DAP VARIABLES. **********************************(5D)

 6036                       E6,1444  E6,1444 V97VCNTR ERASE                   B(1)
 6037                       E6,1445  E6,1446 TEMPDAP  ERASE  +1               B(2)
 6038   REF   1            E6,1445          MRKRTMP  =      TEMPDAP                ((B(1)))
 6039                       E6,1447  E6,1447 CNTR     ERASE                   B(1)
 6040                       E6,1450  E6,1450 CGAD     ERASE                   B(1)
A6041

R6042   ******** EXCLUSIVE RCS DAP VARIABLES.  **********************************(13D)

 6044                       E6,1451  E6,1465 RWORD1   ERASE          +12D     B(1)
 6045   REF   1            E6,1452          RWORD2   EQUALS RWORD1  +1       B(1)
 6046   REF   1            E6,1453          PWORD1   EQUALS RWORD2  +1       B(1)
 6047   REF   1            E6,1454          PWORD2   EQUALS PWORD1  +1       B(1)
 6048   REF   1            E6,1455          YWORD1   EQUALS PWORD2  +1       B(1)
 6049   REF   1            E6,1456          YWORD2   EQUALS YWORD1  +1       B(1)
 6050   REF   1            E6,1457          BLAST    EQUALS YWORD2  +1       B(2)
 6051   REF   1            E6,1461          BLAST1   EQUALS BLAST   +2       B(2)
 6052   REF   1            E6,1463          BLAST2   EQUALS BLAST1  +2       B(2)
 60525  REF   1            E6,1465          T5PHASE  EQUALS BLAST2  +2       B(1)
A60526

R6053   ******** RCS/TVC DAP COMMON STORAGE.**************************************(16D)

 6055                       E6,1466  E6,1466 DAPDATR1 ERASE                   B(1)DSP NOUN 46(R1)
 6056                       E6,1467  E6,1467 DAPDATR2 ERASE                   B(1)DSP NOUN 46(R2)

 6057                       E6,1470  E6,1470 IXX      ERASE                   B(1) CONSECUTIVE WITH IAVG, IAVG/TLX FOR
 6058                       E6,1471  E6,1471 IAVG     ERASE                   B(1)                                    MASSPROP
 6059                       E6,1472  E6,1472 IAVG/TLX ERASE                   B(1)

 6060                       E6,1473  E6,1474 LEMMASS  ERASE          +1       B(1) DSP NOUN 47 (R2)        LEM/CSMMASS
 6061   REF   1            E6,1474          CSMMASS  EQUALS LEMMASS +1       B(1) DSP NOUN 47 (R1)        FOR DOWNLINK
 6062                       E6,1475  E6,1475 WEIGHT/G ERASE                   B(1)
 6063   REF   1            E6,1475          MASS     =       WEIGHT/G

 6064                       E6,1476  E6,1476 AK       ERASE
 6065                       E6,1477  E6,1477 AK1      ERASE
 6066                       E6,1500  E6,1500 AK2      ERASE

 6067                       E6,1501  E6,1501 RCSFLAGS ERASE                   B(1) CONSECUTIVE WITHAK2 DOWNLINK
 6068                       E6,1502  E6,1502 T5TEMP   ERASE                   B(1)
 6069                       E6,1503  E6,1503 EDRIVEX  ERASE
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 6070                    E6,1504  E6,1504   EDRIVEY  ERASE
 6071                    E6,1505  E6,1505   EDRIVEZ  ERASE

R6072           INTEMP THRU INTEMP+14D  ARE RESERVED FOR OVERLAYED TVC/RCS INTERUP TRUE TEMPORIES
 6074                    E6,1506  E6,1524   INTTEMP  ERASE          +14D    (15)

R6075           TVC/RCS THRU TVCRCS +11D RESERVED FOR DOWNLINKED VARIABLES

 6076                    E6,1525  E6,1540   TVCRCS   ERASE          +11D    (12)
A6077                                                                      RCS (WBODYS,ADOTS)
A6078                                                                      TVC(OMEGACS,OMEGABS)

R6079           TVC DAP TEMPORARY VARIABLES**********************************

R6080           TVC DAP INTERUPT TRUE TEMPORARIES****************************

 6081  REF  1           E6,1506          PHI333   EQUALS INTTEMP          B(1)     TEMPORARY REGISTER
 6082  REF  1           E6,1507          PSI333   EQUALS PHI333   +1      B(1)     COUNTING REGISTER
 6083  REF  1           E6,1510          TEMP333  EQUALS PSI333   +1      B(1)     COUNTING REGISTER
 6084  REF  1           E6,1511          VARST0   EQUALS TEMP333  +1      B(10D)   BREAKPOINTS AND SLOPES
 6085  REF  1           E6,1516          VARST5   =      VARST0   +5
 60851 REF  2 LAST 10C  E6,1522          LASTMASP EQUALS VARST0   +9D     LAST VARSTO WORD
 60852 REF  1           E6,1523          TVCTMP1  EQUALS LASTMASP +1      B(1)
A6086

R6087           *******REGULAR TVC TEMPORARIES*************

R6088           TVC ZEROING LOOP STARTS AT OMEGAYC                                (70D)

 6090  REF  1           E6,1525          OMEGAC   EQUALS TVCRCS           I(6)
 6091  REF  1           E6,1525          OMEGAXC  =      OMEGAC
 6092  REF  2 LAST 10C  E6,1527          OMEGAYC  =      OMEGAC   +2
 6093  REF  3 LAST 10C  E6,1531          OMEGAZC  =      OMEGAC   +4

 6094  REF  2 LAST 10C  E6,1533          OMEGAB   EQUALS TVCRCS   +6      B(6)
 6095  REF  1           E6,1533          OMEGAXB  =      OMEGAB
 6096  REF  2 LAST 10C  E6,1535          OMEGAYB  =      OMEGAB +2
 6097  REF  3 LAST 10C  E6,1537          OMEGAZB  =      OMEGAB +4

 6098  REF  4 LAST 10D  E6,1541          PNSUM    EQUALS OMEGAC   +12D    B(2)
 6099  REF  1           E6,1543          PDSUM    EQUALS PNSUM +2         B(2)

 6100  REF  1           E6,1545          B1       EQUALS PDSUM +2         B(1)
 6101  REF  1           E6,1546          B2       EQUALS B1 +1            B(1)
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6102	REF	1	E6,1547	B3	EQUALS B2 +1	B(1)
6103	REF	1	E6,1550	B4	EQUALS B3 +1	B(1)
6104	REF	1	E6,1551	B5	EQUALS B4 +1	B(1)
6105	REF	1	E6,1552	B6	EQUALS B5 +1	B(1)
6106	REF	1	E6,1553	J1	EQUALS B6 +1	B(2)
6107	REF	1	E6,1555	J2	EQUALS J1 +2	B(2)
6108	REF	1	E6,1557	J3	EQUALS J2 +2	B(2)
6109	REF	1	E6,1561	J4	EQUALS J3 +2	B(2)
6110	REF	1	E6,1563	J5	EQUALS J4 +2	B(2)
6111	REF	1	E6,1565	YNSUM	EQUALS J5 +2	B(2)
6112	REF	1	E6,1567	YDSUM	EQUALS YNSUM +2	B(2)
6113	REF	1	E6,1571	C1	EQUALS YDSUM +2	B(1)
6114	REF	1	E6,1572	C2	EQUALS C1 +1	B(1)
6115	REF	1	E6,1573	C3	EQUALS C2 +1	B(1)
6116	REF	1	E6,1574	C4	EQUALS C3 +1	B(1)
6117	REF	1	E6,1575	C5	EQUALS C4 +1	B(1)
6118	REF	1	E6,1576	C6	EQUALS C5 +1	B(1)
6119	REF	1	E6,1577	Y1	EQUALS C6 +1	B(2)
6120	REF	1	E6,1601	Y2	EQUALS Y1 +2	B(2)
6121	REF	1	E6,1603	Y3	EQUALS Y2 +2	B(2)
6122	REF	1	E6,1605	Y4	EQUALS Y3 +2	B(2)
6123	REF	1	E6,1607	Y5	EQUALS Y4 +2	B(2)
6124	REF	1	E6,1611	ROLLFIRE	EQUALS Y5 +2	B(1)
6125	REF	1	E6,1612	ROLLWORD	EQUALS ROLLFIRE +1	B(1)
6126	REF	1	E6,1613	TEMREG	EQUALS ROLLWORD +1	B(1)
6127	REF	1	E6,1614	STROKER	EQUALS TEMREG +1	B(1)
6129	REF	1	E6,1615	PERRB	EQUALS STROKER +1	B(2)
6130	REF	1	E6,1617	YERRB	EQUALS PERRB +2	B(2)
6131	REF	1	E6,1621	DELPBAR	EQUALS YERRB +2	B(2)
6132	REF	1	E6,1623	DELYBAR	EQUALS DELPBAR +2	B(2)
6133	REF	1	E6,1625	PDELOFF	EQUALS DELYBAR +2	B(2)
6134	REF	1	E6,1627	YDELOFF	EQUALS PDELOFF +2	B(2)

R6135 TVC ZEROING LOOP ENDS HERE

6136	REF	1	E6,1631	PCMD	EQUALS YDELOFF +2	B(1)
6137	REF	1	E6,1632	YCMD	EQUALS PCMD +1	B(1), CONSECUTIVE WITH PCMD
6138	REF	1	E6,1633	TACTOFF	EQUALS YCMD +1	B(2)
6139	REF	1	E6,1635	T5TVCDT	EQUALS TACTOFF +2	B(1)
6140	REF	1	E6,1636	MDT	EQUALS T5TVCDT +1	I(6)

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 6141   REF   1                E6,1644    KPRIMEDT EQUALS MDT      +6     I(2)
 6142   REF   1                E6,1646    KTLX/I   EQUALS KPRIMEDT +2     B(1)
 6143   REF   1                E6,1647    TENMDOT  EQUALS KTLX/I   +1     B(1)
 6144   REF   1                E6,1650    1/CONACC EQUALS TENMDOT  +1     B(1)
 6145   REF   1                E6,1651    VARK     EQUALS 1/CONACC +1     B(1)
 6146   REF   1                E6,1652    REPFRAC  EQUALS VARK     +1     B(1)
 6147   REF   1                E6,1653    VCNTR    EQUALS REPFRAC  +1     B(1)
 61472  REF   1                E6,1654    TVCPHASE EQUALS VCNTR    +1     B(1)
 6148   REF   1                E6,1655    PCDUYPST EQUALS TVCPHASE +1     B(1)
 6149   REF   1                E6,1656    PCDUZPST EQUALS PCDUYPST +1     B(1)
 6150   REF   1                E6,1657    MCDUYDOT EQUALS PCDUZPST +1     B(1)
 6151   REF   1                E6,1660    MCDUZDOT EQUALS MCDUYDOT +1     B(1)
 6152   REF   1                E6,1661    TVCEXPHS EQUALS MCDUZDOT +1     B(1)
 6153   REF   1                E6,1662    MASSTMP  EQUALS TVCEXPHS +1     B(1)    PROTECT
 6154   REF   1                E6,1663    VCNTRTMP EQUALS MASSTMP  +1     B(1)      *PROTECT***

R6155           STROKE TEST VARIABLES

R6156  (6D)
 6157   REF   1                E6,1664    STRKTIME EQUALS VCNTRTMP +1     B(1)
 6158   REF   1                E6,1665    CADDY    EQUALS STRKTIME +1     B(1)
 6159   REF   1                E6,1666    N        EQUALS CADDY    +1     B(1)
 6160   REF   1                E6,1667    BUNKER   EQUALS N        +1     B(1)
 6161   REF   1                E6,1670    REVS     EQUALS BUNKER   +1     B(1)
 6162   REF   1                E6,1671    CARD     EQUALS REVS     +1     B(1)

R6163           TVC ROLL DAP VARIABLES

R6164  (8D)
 6165   REF   1                E6,1672    OGANOW   EQUALS CARD     +1     B(1)
 6166   REF   1                E6,1673    OGAPAST  EQUALS OGANOW   +1     B(1)
 6167   REF   1                E6,1674    OGA      EQUALS OGAPAST  +1     B(1)TMP
 6168   REF   1                E6,1674    OGAERR   =      OGA             (ROLL DAP USES OGA, MEANS OGAERROR)
 6169   REF   2  LAST 102      E6,1675    DELOGART EQUALS OGA      +1     B(1)TMP
 6170   REF   1                E6,1676    SGNRT    EQUALS DELOGART +1     SIGN OF OGA RATE
 6171   REF   1                E6,1677    DELOGA   EQUALS SGNRT    +1     USED IN ROLL LOGIC
 6172   REF   1                E6,1700    I        EQUALS DELOGA   +1     USED IN ROLL LOGIC
 6173   REF   1                E6,1701    IOGARATE EQUALS I        +1     USED IN ROLL LOGIC

R6174           TVC DAP RESTART TEMPORARIES.                             (33D)

 6176   REF   1                E6,1702    TKTLX/I  EQUALS IOGARATE +1     B(1)
 6177   REF   1                E6,1703    PACTTMP  EQUALS TKTLX/I  +1     B(2)
 6178   REF   1                E6,1705    YACTTMP  EQUALS PACTTMP  +2     B(2)
 6179   REF   1                E6,1707    CNTRTMP  EQUALS YACTTMP  +2     B(1)
 6180   REF   1                E6,1710    STRKTTMP EQUALS CNTRTMP  +1     B(1)
 6181   REF   1                E6,1711    NSUMTMP  EQUALS STRKTTMP +1     B(2)
 6182   REF   1                E6,1713    DSUMTMP  EQUALS NSUMTMP  +2     B(2)
 6183   REF   1                E6,1715    DELBRTMP EQUALS DSUMTMP  +2     B(2)
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6184   REF   1                E6,1717    B1TMP    EQUALS DELBRTMP +2      B(1)
6185   REF   1                E6,1720    B2TMP    EQUALS B1TMP +1         B(1)
6186   REF   1                E6,1721    B3TMP    EQUALS B2TMP +1         B(1)
6187   REF   1                E6,1722    B4TMP    EQUALS B3TMP +1         B(1)
6188   REF   1                E6,1723    B5TMP    EQUALS B4TMP +1         B(1)
6189   REF   1                E6,1724    B6TMP    EQUALS B5TMP +1         B(1)
6190   REF   1                E6,1725    B7TMP    EQUALS B6TMP +1         B(1)

6191   REF   1                E6,1726    J1TMP    EQUALS B7TMP +1         B(2)
6192   REF   1                E6,1730    J2TMP    EQUALS J1TMP +2         B(2)
6193   REF   1                E6,1732    J3TMP    EQUALS J2TMP +2         B(2)
6194   REF   1                E6,1734    J4TMP    EQUALS J3TMP +2         B(2)
6195   REF   1                E6,1736    J5TMP    EQUALS J4TMP +2         B(2)
6196   REF   1                E6,1740    J6TMP    EQUALS J5TMP +2         B(2)
6197   REF   1                E6,1742    ERRBTMP  EQUALS J6TMP    +2     B(2)
6198   REF   1                E6,1744    CMDTMP   EQUALS ERRBTMP +2       B(2)

R6199          OVERLAYS WITHIN TVC CAP

6200   REF   4  LAST  100     E6,1533    OGARATE  =       OMEGAB          B(2)

6201   REF   2  LAST  103     E6,1742    BZERO    =       ERRBTMP
6202   REF   3  LAST  103     E6,1742    CZERO    =       ERRBTMP
6203   REF   1                E6,1744    JZERO    =       CMDTMP
6204   REF   2  LAST  103     E6,1744    YZERO    =       CMDTMP
6205   REF   2  LAST  102     E6,1651    KPGEN3   =       VARK
6206   REF   1                E6,1651    KYGEN3   =       KPGEN3

6207   REF   4  LAST  103     E6,1742    EP       =       ERRBTMP
6208   REF   3  LAST  103     E6,1744    NPD      =       CMDTMP
6209   REF   2  LAST  101     E6,1561    NP0      EQUALS  J4                      (B(2))
6210   REF   2  LAST  101     E6,1563    NP1      EQUALS  J5                      (B(2))
6211   REF   2  LAST  100     E6,1541    NP2      EQUALS  PNSUM                   (B(2))
6212   REF   2  LAST  100     E6,1543    NP3      EQUALS  PDSUM                   (B(2))

6213   REF   2  LAST  103     E6,1736    NP1TMP   EQUALS  J5TMP                 (B(2))
6214   REF   2  LAST  102     E6,1711    NP2TMP   EQUALS  NSUMTMP               (B(2))
6215   REF   2  LAST  102     E6,1713    NP3TMP   EQUALS  DSUMTMP               (B(2))

6216   REF   5  LAST  103     E6,1742    EY       =       ERRBTMP
6217   REF   4  LAST  103     E6,1744    NYD      =       CMDTMP
6218   REF   2  LAST  101     E6,1605    NY0      EQUALS  Y4                      (B(2))
6219   REF   2  LAST  101     E6,1607    NY1      EQUALS  Y5                      (B(2))
6220   REF   2  LAST  101     E6,1565    NY2      EQUALS  YNSUM                   (B(2))
6221   REF   2  LAST  101     E6,1567    NY3      EQUALS  YDSUM                   (B(2))

6222   REF   1                E6,1736    NY1TMP   EQUALS  Y5TMP                 (B(2))
6223   REF   3  LAST  103     E6,1711    NY2TMP   EQUALS  NSUMTMP               (B(2))
6224   REF   3  LAST  103     E6,1713    NY3TMP   EQUALS  DSUMTMP               (B(2))
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6225  REF  2  LAST  103  E6,1717   C1TMP   =   B1TMP   (B(1))
6226  REF  2  LAST  103  E6,1720   C2TMP   =   B2TMP   (B(1))
6227  REF  2  LAST  103  E6,1721   C3TMP   =   B3TMP   (B(1))
6228  REF  2  LAST  103  E6,1722   C4TMP   =   B4TMP   (B(1))
6229  REF  2  LAST  103  E6,1723   C5TMP   =   B5TMP   (B(1))
6230  REF  2  LAST  103  E6,1724   C6TMP   =   B6TMP   (B(1))
6231  REF  2  LAST  103  E6,1725   C7TMP   =   B7TMP   (B(1))

6232  REF  2  LAST  103  E6,1726   Y1TMP   =   J1TMP   (B(2))
6233  REF  2  LAST  103  E6,1730   Y2TMP   =   J2TMP   (B(2))
6234  REF  2  LAST  103  E6,1732   Y3TMP   =   J3TMP   (B(2))
6235  REF  2  LAST  103  E6,1734   Y4TMP   =   J4TMP   (B(2))
6236  REF  3  LAST  103  E6,1736   Y5TMP   =   J5TMP   (B(2))
6237  REF  2  LAST  103  E6,1740   Y6TMP   =   J6TMP   (B(2))


R62371

R62372          S40.9 STORAGE.....

62373  REF  5  LAST  103  E6,1746   NBRCYCLS EQUALS CMDTMP  +2     B(1)     COUNTER FOR P40,41 STEERING
62374  REF  1             E6,1747   NBRCYCLP EQUALS NBRCYCLS +1    B(1) MAINTAIN ORDER
62375  REF  1             E6,1750   DELVSUM  EQUALS NBRCYCLP +1    I(6)  P40,P41
62376  REF  1             E6,1756   DELVSUMP EQUALS DELVSUM +6     I(6)  P40,P41
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P6238 ******** RCS DAP TEMPORARY VARIABLES.**********(95D)

R6240 **RCS INTERUPT TRUE TEMPS********** 15D

6242	REF	2	LAST 100	E6,1506	SPNDX	EQUALS INTTEMP		B(1)	
6243	REF	1		E6,1507	DPNDX	EQUALS SPNDX	+1	B(1)TMP	
6244	REF	1		E6,1510	KMPAC	EQUALS DPNDX	+1	B(2)TMP	
6245	REF	1		E6,1512	KMPTEMP	EQUALS KMPAC	+2	B(1)TMP	
6246	REF	1		E6,1513	XNDX1	EQUALS KMPTEMP	+1	B(1)TMP	XNDX1 THRU NYJETS ARE OVERLAYED
6247	REF	1		E6,1514	XNDX2	EQUALS XNDX1	+1	B(1)TMP	BY OTHER DAP ERASABLES SO
6248	REF	1		E6,1515	YNDX	EQUALS XNDX2	+1	B(1)TMP	SHOULD ALWAYS BE DEFINED IN
6249	REF	1		E6,1516	ZNDX	EQUALS YNDX	+1	B(1)TMP	A BLOCK
6250	REF	1		E6,1517	RINDEX	EQUALS ZNDX	+1	B(1)TMP	
6251	REF	1		E6,1520	PINDEX	EQUALS RINDEX	+1	B(1)TMP	
6252	REF	1		E6,1521	YINDEX	EQUALS PINDEX	+1	B(1)TMP	
6253	REF	1		E6,1522	NRJETS	EQUALS YINDEX	+1	B(1)TMP	
6254	REF	1		E6,1523	NPJETS	EQUALS NRJETS	+1	B(1)TMP	
6255	REF	1		E6,1524	NYJETS	EQUALS NPJETS	+1	B(1)TMP	
6256	REF	2	LAST 105	E6,1513	WTEMP	EQUALS XNDX1		B(2)TMP	WTEMP THRU DELTEMPZ OVERLAY
6257	REF	1		E6,1515	DELTEMPX	EQUALS WTEMP	+2	B(2)TMP	XNDX1 THRU NRJETS AND EDOT THRU
6258	REF	1		E6,1517	DELTEMPY	EQUALS DELTEMPX	+2	B(2)TMP	ADBVEL
6259	REF	1		E6,1521	DELTEMPZ	EQUALS DELTEMPY	+2	B(2)TMP	
6260	REF	2	LAST 105	E6,1515	EDOT	EQUALS YNDX		B(2)TMP	EDOT THRU ADBVEL OVERLAY
6261	REF	1		E6,1517	AERR	EQUALS EDOT	+2	B(1)TMP	YNDX THRU NPJETS AND DELTEMPX
6262	REF	1		E6,1520	EDOTVEL	EQUALS AERR	+1	B(2)TMP	THRU DELTEMPZ
6263	REF	1		E6,1522	AERRVEL	EQUALS EDOTVEL	+2	B(1)TMP	
6264	REF	1		E6,1523	ADBVEL	EQUALS AERRVEL	+1	B(1)TMP	

R6265 *** REGULAR RCS TEMPS********** ( ).

R6267 RCS ZEROING LOOP STARTS HERE**** ** ** ** *** *** * * (37)

6269	REF	3	LAST 100	E6,1525	WBODY	EQUALS TVCRCS		B(2)TMP	
6270	REF	1		E6,1527	WBODY1	EQUALS WBODY	+2	B(2)TMP	
6271	REF	2	LAST 105	E6,1531	WBODY2	EQUALS WBODY	+4	B(2)TMP	
6272	REF	1		E6,1533	ADOT	EQUALS WBODY2	+2	B(2)TMP	
6273	REF	1		E6,1535	ADOT1	EQUALS ADOT	+2	B(2)TMP	
6274	REF	1		E6,1537	ADOT2	EQUALS ADOT1	+2	B(2)TMP	
6278	REF	1		E6,1541	MERRORX	EQUALS ADOT2	+2	(2)	
6279	REF	1		E6,1543	MERRORY	EQUALS MERRORX	+2	(2)	
6280	REF	1		E6,1545	MERRORZ	EQUALS MERRORY	+2	(2)	
6281	REF	1		E6,1547	DFT	EQUALS MERRORZ	+2		B(1)TMP
6282	REF	1		E6,1550	DFT1	EQUALS DFT	+1	B(1)TMP	
6283	REF	1		E6,1551	DFT2	EQUALS DFT1	+1	B(1)TMP	
6284	REF	1		E6,1552	DRHO	EQUALS DFT2	+1	B(2)TMP	
6285	REF	1		E6,1554	DRHO1	EQUALS DRHO	+2	B(2)TMP	

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 6286   REF   1          E6,1556     DRHO2    EQUALS DRHO1    +2     B(2)TMP
 6287   REF   1          E6,1560     ATTSEC   EQUALS DRHO2    +2     B(1)TMP
 6288   REF   1          E6,1561     TAU      EQUALS ATTSEC   +1     B(1)TMP
 6289   REF   1          E6,1562     TAU1     EQUALS TAU      +1     B(1)TMP
 6290   REF   1          E6,1563     TAU2     EQUALS TAU1     +1     B(1)TMP
 6291   REF   1          E6,1564     BIAS     EQUALS TAU2     +1     B(1)TMP
 6292   REF   1          E6,1565     BIAS1    EQUALS BIAS     +1     B(1)TMP
 6293   REF   1          E6,1566     BIAS2    EQUALS BIAS1    +1     B(1)TMP
 62931  REF   1          E6,1567     ERRORX   EQUALS BIAS2    +1     B(1)TMP
 62932  REF   1          E6,1570     ERRORY   EQUALS ERRORX   +1     B(1)TMP
 62933  REF   1          E6,1571     ERRORZ   EQUALS ERRORY   +1     B(1)TMP
A6294

R6295                RCS ZERO LOOP ENDS HERE

R6296                     MORE RCS                                   (69D)

 6300   REF   1          E6,1572     THETADX  EQUALS ERRORZ   +1     B(1)TMP  MUST BE CONSECUTIVE WITH ERRORZ
 6301   REF   1          E6,1573     THETADY  EQUALS THETADX  +1     B(1)TMP
 6302   REF   1          E6,1574     THETADZ  EQUALS THETADY  +1     B(1)TMP

 6303   REF   1          E6,1575     DELCDUX  EQUALS THETADZ  +1     B(2)TMP
 6304   REF   1          E6,1577     DELCDUY  EQUALS DELCDUX  +2     B(2)TMP
 6305   REF   1          E6,1601     DELCDUZ  EQUALS DELCDUY  +2     B(2)TMP

 6306   REF   1          E6,1603     DCDU     EQUALS DELCDUZ  +2     B(6)TMP USED DURING P20
 63065  REF   1          E6,1611     DTHETASM EQUALS DCDU     +6     B(6)TMP STEER LOW OUTPUT.

 6307   REF   1          E6,1617     ATTKALMN EQUALS DTHETASM +6     B(1)TMP
 6308   REF   1          E6,1620     KMJ      EQUALS ATTKALMN +1     B(1)TMP
 6309   REF   1          E6,1621     KMJ1     EQUALS KMJ      +1     B(1)TMP
 6310   REF   1          E6,1622     KMJ2     EQUALS KMJ1     +1     B(1)TMP
 6311   REF   1          E6,1623     J/M      EQUALS KMJ2     +1     B(1)TMP
 6312   REF   1          E6,1624     J/M1     EQUALS J/M      +1     B(1)TMP
 6313   REF   1          E6,1625     J/M2     EQUALS J/M1     +1     B(1)TMP
 6314   REF   1          E6,1626     RACFAIL  EQUALS J/M2     +1     B(1)TMP
 6315   REF   1          E6,1627     RBDFAIL  EQUALS RACFAIL  +1     B(1)TMP
 6316   REF   1          E6,1630     ACORBD   EQUALS RBDFAIL  +1     B(1)TMP
 6317   REF   1          E6,1631     XTRANS   EQUALS ACORBD   +1     B(1)TMP
 6318   REF   1          E6,1632     CH31TEMP EQUALS XTRANS   +1     B(1)TMP
 6319   REF   1          E6,1633     CHANTEMP EQUALS CH31TEMP +1     B(1)TMP
 6320   REF   1          E6,1634     TSTIME   EQUALS CHANTEMP +1     B(1)TMP
 6321   REF   1          E6,1635     RHO      EQUALS TSTIME   +1     B(1)TMP
 6322   REF   1          E6,1636     RHO1     EQUALS RHO      +1     B(1)TMP
 6323   REF   1          E6,1637     RHO2     EQUALS RHO1     +1     B(1)TMP
 6324   REF   1          E6,1640     AMGB1    EQUALS RHO2     +1     B(1)TMP
 6325   REF   1          E6,1641     AMGB4    EQUALS AMGB1    +1     B(1)TMP
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6326  REF  1        E6,1642     AMGB5    EQUALS AMGB4    +1    B(1)TMP
6327  REF  1        E6,1643     AMGB7    EQUALS AMGB5    +1    B(1)TMP
6328  REF  1        E6,1644     AMGB8    EQUALS AMGB7    +1    B(1)TMP
6329  REF  1        E6,1645     CAPSI    EQUALS AMGB8    +1    B(1)TMP
6330  REF  1        E6,1646     CDUXD    EQUALS CAPSI    +1    B(2)TMP
6331  REF  1        E6,1650     CDUYD    EQUALS CDUXD    +2    B(2)TMP
6332  REF  1        E6,1652     CDUZD    EQUALS CDUYD    +2    B(2)TMP
6333  REF  1        E6,1654     SLOPE    EQUALS CDUZD    +2    B(1)TMP
6334  REF  1        E6,1655     ADB      EQUALS SLOPE    +1    B(1)TMP
6335  REF  1        E6,1656     RMANNDX  EQUALS ADB      +1    B(1)TMP
6336  REF  1        E6,1657     PMANNDX  EQUALS RMANNDX  +1    B(1)TMP
6337  REF  1        E6,1660     YMANNDX  EQUALS PMANNDX  +1    B(1)TMP  MUST BE LAST VARIABLE IN RCS
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P6338   ******** ENTRY DAP TEMPORARY VARIABLES.**********************************(69D)

R6340    ANGLE REGISTERS FOR ENTRY DAPS

 6341   REF   1          E6,1661          AOG       EQUALS BCDU              1P
 6342   REF   1          E6,1662          AIG       EQUALS AOG +1            1P
 6343   REF   1          E6,1663          AMG       EQUALS AIG +1            1P
 6344   REF   1          E6,1664          ROLL/180  EQUALS AMG      +1      1P
 6345   REF   1          E6,1665          ALFA/180  EQUALS ROLL/180 +1      1P
 6346   REF   1          E6,1666          BETA/180  EQUALS ALFA/180 +1      1P
 6347   REF   1          E6,1667          AOG/PIP   EQUALS BETA/180 +1      1P
 6348   REF   1          E6,1670          AIG/PIP   EQUALS AOG/PIP  +1      1P
 6349   REF   1          E6,1671          AMG/PIP   EQUALS AIG/PIP  +1      1P
 6350   REF   1          E6,1672          ROLL/PIP  EQUALS AMG/PIP  +1      1P
 6351   REF   1          E6,1673          ALFA/PIP  EQUALS ROLL/PIP +1      1P
 6352   REF   1          E6,1674          BETA/PIP  EQUALS ALFA/PIP +1      1P

R6353   GYMBAL DIFFERENCES OVER INTERVAL TCDU = .1 SEC.

 6354   REF   1          E6,1675          -DELAOG   EQUALS BETA/PIP +1      1P
 6355   REF   1          E6,1676          -DELAIG   EQUALS -DELAOG +1       1P
 6356   REF   1          E6,1677          -DELAMG   EQUALS -DELAIG +1       1P

R6359   ESTIMATED BODY RATES

63591   REF   1          E6,1700          CMDAPMOD EQUALS -DELAMG +1        1P  GOES BEFORE PREL FOR TM.

 6360   REF   1          E6,1701          PREL      EQUALS CMDAPMOD +1      1P  P TCDU/180      (ROLLDOT)
 6361   REF   1          E6,1702          QREL      EQUALS PREL +1          1P  Q TCDU/180      (PITCHDOT)
 6362   REF   1          E6,1703          RREL      EQUALS QREL +1          1P  R TCDU/180      (YAWDOT)

 6363   REF   1          E6,1704          BETADOT   EQUALS RREL     +1      1P  MUST FOLLOW RREL. BETADOT TCDU/180
 6364   REF   1          E6,1705          PHIDOT    EQUALS BETADOT  +1      1P

R6365   OLD (UNAVERAGED) BODY RATE MEASURE

 6366   REF   1          E6,1706          OLDELP    EQUALS PHIDOT   +1      1P
 6367   REF   1          E6,1707          OLDELQ    EQUALS OLDELP +1        1P
 6368   REF   1          E6,1710          OLDELR    EQUALS OLDELQ +1        1P

 6372   REF   1          E6,1711          JETAG     EQUALS OLDELR  +1       1P
 6373   REF   1          E6,1712          TUSED     EQUALS JETAG +1         1P  ELAPSED TIME SINCE NOMINAL UPDATE.
A63731

R6374            FOLLOWING 3 SP WORDS IN DOWNLINK.  ROLLTM SENT EACH 1 SEC.

 6375   REF   1          E6,1713          PAXERR1   EQUALS TUSED    +1      1P  INTEGRATED ROLL ERROR/360.
 6376   REF   1          E6,1714          ROLLTM    EQUALS PAXERR1  +1      1P  ROLL/180 FOR TM.
 6377   REF   1          E6,1715          ROLLC     EQUALS ROLLTM   +1      2P  ROLLCOM/360 FROM ENTRY (FOR TM)
A63771                                                                        >> KEEP ROLLC & ROLLHOLD ADJACENT FOR TP
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 6378  REF  1            E6,1717          ROLLHOLD EQUALS ROLLC    +2     1P FOR ATTITUDE HOLD IN CMDAPMOD = +1
A63781

R63782          ENTRY DAP QUANTITIES THAT SHARE WITH RCS DAP.

 6379  REF  2 LAST 106   E6,1603          ALFACOM  EQUALS DCDU             1P  KEEP ADJACENT TO BETACOM.  <<
 6380  REF  1            E6,1604          BETACOM  EQUALS ALFACOM +1       1P

R6381  JET LIST:   DT, JETBITS  IN THIS ORDER.

 6382  REF  1            E6,1605          TOFF     EQUALS BETACOM +1       1P  DP PAIR
 6383  REF  1            E6,1606          TBITS    EQUALS TOFF +1          1P
 6384  REF  1            E6,1607          TON2     EQUALS TBITS +1         1P  DP PAIR
 6385  REF  1            E6,1610          T2BITS   EQUALS TON2 +1          1P

R6386   MISCELLANEOUS PERMANENT ERASEABLE.

 6388  REF  1            E6,1611          OUTTAG   EQUALS T2BITS  +1       1P
 6389  REF  1            E6,1612          NUJET    EQUALS OUTTAG +1        1P
R63891    MORE  ENTRY DAP QUANTITIES THAT  DO NOT SHARE WITH RCS DAP.

63892  REF  1            E6,1720          JETEM    EQUALS ROLLHOLD +1      2P  THIS DP USED IN RATEAVG.
 6390  REF  1            E6,1722          GAMA     EQUALS JETEM    +2      1P
 6391  REF  1            E6,1723          GAMDOT   EQUALS GAMA     +1      1P
 6392  REF  1            E6,1724          POSEXIT  EQUALS GAMDOT   +1      1P
 6393  REF  1            E6,1725          CM/GYMDT EQUALS POSEXIT  +1      1P
 6394  REF  1            E6,1726          HEADSUP  EQUALS CM/GYMDT +1      1P  DSP NOUN 61 FOR P62,63,64,67.
63941  REF  1            E6,1727          P63FLAG  EQUALS HEADSUP  +1      1P  INTERLOCK FOR WAKEP62
A63945

A63946                                                  >> SHARE BELOW WITH RCS RUPT TEMPS (< 150) <<<
 6395  REF  2 LAST 105   E6,1506          CALFA    EQUALS SPNDX            1P
 6396  REF  1            E6,1507          SALFA    EQUALS CALFA +1         1P

 6397  REF  1            E6,1510          SINM     EQUALS SALFA +1         1P
 6398  REF  1            E6,1511          COSM     EQUALS SINM +1          1P
 6399  REF  1            E6,1512          SINO     EQUALS COSM +1          1P
 6400  REF  1            E6,1513          COSO     EQUALS SINO +1          1P
 6401  REF  1            E6,1514          SINOCOSM EQUALS COSO +1          1P
 6402  REF  1            E6,1515          COSOCOSM EQUALS SINOCOSM +1      1P
A64021                                                  >> SHARE ABOVE WITH RCS RUPT TEMPS          <<<
A6403
R6404           THE FOLLOWING FEW REGISTERS USED ONCE EACH 2 SEC.

 6405  REF  1            E6,1613          -VT/180  EQUALS NUJET   +1      1P
 6406  REF  1            E6,1614          LCX/360  EQUALS -VT/180 +1      1P
 6407  REF  1            E6,1615          XD/360   EQUALS LCX/360 +1      1P
 6408  REF  1            E6,1616          VSQ/4API EQUALS XD/360  +1      1P
 6409  REF  1            E6,1617          JNDX     EQUALS VSQ/4API +1     1P
 6410  REF  1            E6,1620          JNDX1    EQUALS JNDX +1         1P
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 6411   REF   1              E6,1621          TON1     EQUALS JNDX1 +1        1P   DP PAIR
 6412   REF   1              E6,1622          T1BITS   EQUALS TON1     +1    1P

R64121          MISCELLANEOUS REGISTERS USED EACH UPDATE.

 6413   REF   1              E6,1623          CM/SAVE  EQUALS T1BITS   +1    1P
 64131  REF   1              E6,1624          JETEM2   EQUALS CM/SAVE +1    1P   TEMPORARY STORAGE
A6414
R6418           DAP  QUANTITIES SHARED WITH RCS DAP FOR TM & FLIGHT RECORDER.

 6419   REF   2 LAST 106     E6,1567          VDT/180  =       ERRORX         1P   (EDIT)
 6420   REF   2 LAST 106     E6,1570          -VT/180E =       ERRORY         1P   (EDIT)

 6421   REF   1              E6,1476          PAXERR   EQUALS AK              1P   ROLL ERROR FOR NEEDLES
 6422   REF   2 LAST 106     E6,1572          QAXERR   =       THETADX        1P   SINCE AK1 IS ZEROED IN ATM DAP.
 6423   REF   1              E6,1573          RAXERR   =       QAXERR   +1    1P   SINCE AK2 IS ZEROED IN TM DAP.
A6424


R6425           **** CDUMANU (R60,R62) ****

 6426   REF   1              E6,1710          VECQTEMP EQUALS CDFSKEW
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P6427   ******** KALCMANU VARIABLES. (71D) ************************************
 6428   REF   1              E6,1661    BCDU     EQUALS YMANNDX  +1     B(3) TMP
 6429   REF   2  LAST 108    E6,1664    KSPNDX   EQUALS BCDU +3        B(1)TMP
 6430   REF   1              E6,1665    KDPNDX   EQUALS KSPNDX   +1     B(1)TMP

 6431   REF   1              E6,1666    TMIS     EQUALS KDPNDX   +1     I(18) MUST BE IN SAME BANK AS RCS DAP
 6432   REF   1              E6,1710    COFSKEW  EQUALS TMIS     +18D   I(6)  MUST BE IN SAME BANK AS RCS DAP
 6433   REF   2  LAST 110    E6,1716    CAM      EQUALS COFSKEW  +6     I(2)  MUST BE IN SAME BANK AS RCS DAP

 6434   REF   1              E6,1720    MIS      EQUALS CAM      +2     I(18)  (THE REST MAY GO ANYWHERE)
 6435   REF   1              E6,1742    COF      EQUALS MIS      +18D   I(6)TMP
 6436   REF   1              E6,1750    SCAXIS   EQUALS COF      +6     I(6)TMP
 6437   REF   1              E6,1756    POINTVSM EQUALS SCAXIS   +6     I(6)TMP
 6438   REF   1              E6,1764    AM       EQUALS POINTVSM +6     I(2)TMP
 6439   REF   1              E6,1766    RAD      EQUALS AM       +2     I(2)TMP

R6440   FIRST-ORDER OVERLAYS IN KALCMANU

 6441   REF   2  LAST 111    E6,1666    KV1      EQUALS TMIS            I(6)TMP
 6442   REF   3  LAST 111    E6,1666    MFISYM   EQUALS TMIS            I   TMP
 6443   REF   4  LAST 111    E6,1666    TMFI     EQUALS TMIS            I   TMP
 6444   REF   5  LAST 111    E6,1666    NCDU     EQUALS TMIS            B   TMP
 6445   REF   6  LAST 111    E6,1671    NEXTIME  EQUALS TMIS     +3     B   TMP
 6446   REF   7  LAST 111    E6,1672    TTEMP    EQUALS TMIS     +4     B   TMP
 6447   REF   8  LAST 111    E6,1674    KV2      EQUALS TMIS     +6     I(6)TMP
 6448   REF   9  LAST 111    E6,1674    BIASTEMP EQUALS TMIS     +6     B   TMP
 6449   REF  10  LAST 111    E6,1702    KV3      EQUALS TMIS     +12D   I(6)TMP
 6450   REF  11  LAST 111    E6,1702    OGF      EQUALS TMIS     +12D   I   TMP

 6451   REF   3  LAST 111    E6,1710    BRATE    EQUALS COFSKEW         B   TMP
 6453   REF   2  LAST 111    E6,1716    TM       EQUALS CAM             B   TMP

R6454   SECOND-ORDER OVERLAYS IN KALCMANU

 6455   REF   1              E6,1666    P21      EQUALS KV1             I(2)TMP
 6456   REF   2  LAST 111    E6,1670    D21      EQUALS KV1      +2     I(2)TMP
 6457   REF   3  LAST 111    E6,1672    G21      EQUALS KV1      +4     I(2)TMP
A6458

R6464           SATURN BCOST STORAGE. SAVE TILL RCS DAP OPERATION.      (17D)

 6466   REF   3  LAST 111    E6,1661    POLYNUM  EQUALS BCDU            B(15) PAD LOADED
 6467   REF   1              E6,1673    POLYLOC  =      POLYNUM  +10D
 6468   REF   2  LAST 111    E6,1700    SATRLRT  EQUALS POLYNUM  +15D   B(2)  PAD LOADED
A6469

R6470           MORE P11 STORAGE -PAD LOADED-                           (2D)
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R6472           (NOTE: THIS PAD LOAD WILL NOT BE PRESERVED THROUGHOUT THE MISSION AS IT SHARES STORAGE WITH KALCMANU,
R6474            ENTRY DAP AND TVC DAP)

 6475  REF  1          E6,1702          RPSTART  EQUALS SATRLRT  +2     B(1) PITCH ROLL START TIME
 6476  REF  1          E6,1703          POLYSTOP EQUALS RPSTART  +1     B(1) POLYCUT OFF MINUS RPSTART SEC
A6477


R6478           STORAGE FOR VHHDOT AND ATTOSP

 6479  REF  1          E6,1704          BODY3    EQUALS POLYSTOP +1     B(1)OUT
 6480  REF  1          E6,1705          BODY2    EQUALS BODY3    +1     B(1)OUT
 6481  REF  1          E6,1706          BODY1    EQUALS BODY2    +1     B(1)OUT
 6482  REF  1          E6,1707          SPOLYARG EQUALS BODY1    +1     B(1)TMP  ARGUEMENT FOR POLLY

 6483  REF  1          E6,1503          OLDBODY1 =      EDRIVEX                 1 PULSE = 0.0432 DEGREES
 6484  REF  1          E6,1504          OLDBODY2 =      EDRIVEY
 6485  REF  1          E6,1505          OLDBODY3 =      EDRIVEZ


R6486           STORAGE FOR S11.1

 6487  REF  1          E6,1710          VDISP    EQUALS SPOLYARG +1     I(2)OUT   2(7)  M/CS
 6488  REF  1          E6,1712          HDISP    EQUALS VDISP    +2     I(2)OUT   2(29) M
 6489  REF  1          E6,1714          HDOTDISP EQUALS HDISP +2        I(2) OUT  2(7) M/CS
 6490  REF  1          E6,1716          BOOSTEMP EQUALS HDOTDISP +2     B(2) TEMP

R6491           P21 STORAGE.                                            (1D)

 6493  REF  1          E6,1770          GENRET   EQUALS RAD      +2     B(1)TMP

R6494           R61CSM STORAGE.                                         (1D)

 6496  REF  1          E6,1771          SAVBNK   EQUALS GENRET   +1     B(1) S-S SAVE EBANK FOR R61 SUBROUTINE

R6497           CRS61.1 STORAGE FOR AUTOPILOT BANK.                     (3D)

 6499  REF  1          E6,1772          SAVEDCDU EQUALS SAVBNK   +1     B(3) TMP
A6500

R6501           R61 STORAGE.                                            (1D)

 6503  REF  1          E6,1775          R61CNTR  EQUALS SAVEDCDU +3      (1)TMP

R6504           ENTRY RESTART PROTECTION STORAGE. -KEEP TEMPS IN ORDER-  (12D)
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 6506   REF   2  LAST  112   E6,1770          TEMPROLL EQUALS GENRET          B(1)TMP COPY CYCLE REGISTER
 6507   REF   1               E6,1771          TEMPALFA EQUALS TEMPROLL +1     B(1)TMP COPY CYCLE REGISTER
 6508   REF   1               E6,1772          TEMPBETA EQUALS TEMPALFA +1     B(1)TMP COPY CYCLE REGISTER
 6509   REF   1               E6,1773          60GENRET EQUALS TEMPBETA +1     B(1)TMP QSAVE FOR S61.1 AND ENTRY.
 6510   REF   1               E6,1774          S61DT    EQUALS 60GENRET +1     B(1)TMP VARIABLE DT FOR S61.1 RESTART.
A6511


R6512           ENTRY TM SHARING FOR ACCELERATION PROFILE.

 6513   REF   2  LAST  105   E6,1533          XPIPBUF  EQUALS ADOT            B(1) PIPA BUFFER FOR TM DURING ENTRY.
 6514   REF   1               E6,1534          YPIPBUF  EQUALS XPIPBUF  +1     B(1) PIPS FILED HERE EACH .5 SEC APPEAR
 6515   REF   1               E6,1535          ZPIPBUF  EQUALS YPIPBUF  +1     B(1) ON DOWNLIST ONCE PER SECOND DURING
 6516   REF   1               E6,1536          XOLDBUF  EQUALS ZPIPBUF  +1     B(1) ENTRY AFTER RCS DAP HAS BEEN DIS-
 6517   REF   1               E6,1537          YOLDBUF  EQUALS XOLDBUF  +1     B(1) ABLED. NEWEST PIP VALUE REPLACES
 6518   REF   1               E6,1540          ZOLDBUF  EQUALS YOLDBUF  +1     B(1) PIPBUF,WHICH IS MOVED INTO OLDBUF.
R6519

R6520           REENTRY VARIABLES SHARED WITH RCS DAP FOR TM & FLIGHT RECORDER.

 6521   REF   2  LAST  106   E6,1574          Q7       =       THETADZ        I(2)   HI-WORD ONLY ON DNLIST.

 6522   REF   3  LAST  105   E6,1525          ASPS(TM) =       WBODY          I(6) DWN
A6523                                                                              ASKEP,ASP1,ASPUP,ASPDN,ASP3,ASP3+1
A6524

 6525   REF   1               E6,1776          END-E6   EQUALS R61CNTR  +1     NEXT FREE  E6 ADDRESS
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P7000                   EBANK-7 ASSIGNMENTS

 7001                       E7,1400                  SETLOC 3400


R7002           *-*-*-*-  OVERLAY 0 IN EBANK 7 -*-*-*-*-

R7003           EXTERNAL DELTA-V UPDATE.                                    (21D)

R7005           (MUST BE IN ORDER FOR UPDATE PROGRAM. ALSO ENTRY PROGRAMS PICK UP 'LAT(SPL)' WITH A VLOAD.)

 7007                       E7,1400  E7,1424   LAT(SPL) ERASE          +200  I(2)      DSP NOUN 61 FOR P62,63,64,67
 7008   REF   1             E7,1402            LNG(SPL) EQUALS LAT(SPL) +2   I(2)DSP NOUN 61 FOR P62,63,64,67.

 7009   REF   1             E7,1404            DELVSLV  EQUALS LNG(SPL) +2   I(6)TMP DELTA VEL VECT, LOC VER COORDS
 7010   REF   1             E7,1412            TIG      EQUALS DELVSLV  +6   B(2)DSP NOUN 33 FOR X-V84(R32),P30,40.
 7011   REF   1             E7,1414            RTARG    EQUALS TIG      +2   I(6)IN  DESIRED VEHICHE RADIUS VECTOR
 7012   REF   1             E7,1422            DELLT4   EQUALS RTARG    +6   I(2)IN  TIME DIFFERENCE FOR INITVEL
 7013   REF   1             E7,1424            ECSTEER  EQUALS DELLT4   +2   I(1)PL   FOR P40 S
 70135  REF   2  LAST  114  E7,1404            DELVLVC  =      DELVSLV
 70136                      E7,1425  E7,1425   END-DELV ERASE               *NEXT AVAIL LOC AFTER UNSHARED E7*
R7015           SERVICER STORAGE.                                           (13D)

 7020   REF   1             E7,1425            DVTOTAL  EQUALS END-DELV      B(2) DSP NOUN 40,99 FOR P30,34,35,40
 7021   REF   1             E7,1427            TGO      EQUALS DVTOTAL  +2   B(2)
 7023   REF   1             E7,1431            DVCNTR   EQUALS TGO      +2   B(1)TMP
 7024   REF   5  LAST   32  E7,1432            DELVREF  EQUALS DVCNTR   +1   I(6)TMP

 70241  REF   1             E7,1447            NOMTIG   EQUALS END-KALC      I(2) (CAN NOT SHARE WITH KALCMANU
A702411                                                                      OR DELVREF)
 7025   REF   1             E7,1451            END-SVCR EQUALS NOMTIG   +2   ***NEXT AVAILABLE AFTER SERVICER
A70255


R7026           ALIGNMENT STORAGE.                                          (25D)

 7028   REF   1             E7,1451            XSCD     EQUALS END-SVCR      I(6)TMP
 7029   REF   1             E7,1457            YSCD     EQUALS XSCD     +6   I(6)TMP
 7030   REF   1             E7,1465            ZSCD     EQUALS YSCD     +6   I(6)TMP
 7033   REF   1             E7,1473            VEL/C    EQUALS ZSCD     +6   I(6)TMP
 7034   REF   1             E7,1501            R53EXIT  EQUALS VEL/C    +6   I(1)TMP


R70342          ALIGNMENT MARKDATA (DOWNLNK)******                          (7D)
 70344  REF   1             E7,1502            MARK2DWN EQUALS R53EXIT  +1   (7)  USED BY ALLIGNMENT P50S
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P7035 *-*-*-*- OVERLAY 1 IN EBANK 7 -*-*-*-*

R7036 REENTRY ERASABLES (206D)

7039	REF	2	LAST 114	E7,1451	RTINIT	EQUALS	END-SVCR	6P	
7040	REF	1		E7,1457	RTEAST	EQUALS	RTINIT +6	6P	
7041	REF	1		E7,1465	RTNORM	EQUALS	RTEAST +6	6P	
7042	REF	1		E7,1473	RT	EQUALS	RTNORM +6	6P	
7043	REF	1		E7,1501	UNI	EQUALS	RT +6	6P	
7044	REF	1		E7,1507	UNITV	EQUALS	UNI +6	6P	
7045	REF	1		E7,1515	VEL	EQUALS	UNITV +6	6P	
7046	REF	1		E7,1523	TIME/RTO	EQUALS	VEL +6	2P	TIME OF INITIAL TARGET, RTO.
7047	REF	1		E7,1525	-VREL	EQUALS	TIME/RTO +2	6P	
7048	REF	1		E7,1533	OLDUYA	EQUALS	-VREL +6	6P	USED BY CM/POSE (ENTRY DAP)
7049	REF	1		E7,1541	UXA/2	EQUALS	OLDUYA +6	6P	USED BY CM/POSE (ENTRY DAP) -UVA
70495	REF	1		E7,1541	URH	=	UXA/2		P61 DISPLAY NOUN
7050	REF	2	LAST 115	E7,1547	UYA/2	EQUALS	UXA/2 +6	6P	USED BY CM/POSE (ENTRY DAP) UYA
7051	REF	1		E7,1555	UZA/2	EQUALS	UYA/2 +6	6P	USED BY CM/POSE (ENTRY DAP) UNA
7052	REF	1		E7,1563	UBX/2	EQUALS	UZA/2 +6	6P	USED BY CM/POSE (ENTRY DAP)
7053	REF	1		E7,1571	UBY/2	EQUALS	UBX/2 +6	6P	USED BY CM/POSE (ENTRY DAP)
7054	REF	1		E7,1577	UBZ/2	EQUALS	UBY/2 +6	6P	USED BY CM/POSE (ENTRY DAP)
7055	REF	1		E7,1605	DTEAROT	EQUALS	UBZ/2 +6	2P	
7056	REF	1		E7,1607	DIFF	EQUALS	DTEAROT +2	2P	
7057	REF	1		E7,1611	DIFFOLD	EQUALS	DIFF +2	2P	
7058	REF	1		E7,1613	FACTOR	EQUALS	DIFFOLD +2	2P	
7059	REF	1		E7,1615	FACT1	EQUALS	FACTOR +2	2P	
7060	REF	1		E7,1617	FACT2	EQUALS	FACT1 +2	2P	
A7061					Q7	=	THETADZ	2P	SHARED FOR TM. P64-P66
7062	REF	1		E7,1621	VSQUARE	EQUALS	FACT2 +2	2P	
7065	REF	1		E7,1623	LAD	EQUALS	VSQUARE +2	2P	
7066	REF	1		E7,1625	LOD	EQUALS	LAD +2	2P	
7067	REF	1		E7,1627	L/DCMINR	EQUALS	LOD +2	2P	
7068	REF	1		E7,1631	KLAT	EQUALS	L/DCMINR +2	2P	
7069	REF	1		E7,1633	L/D	EQUALS	KLAT +2	2P	
7070	REF	1		E7,1635	L/D1	EQUALS	L/D +2	2P	
7071	REF	1		E7,1724	LEWD	=	VID	2P	SHARED FOR TM. P64-P65
7072	REF	1		E7,1637	D	EQUALS	L/D1 +2	2P	DSP NOUN 64,66,68 FOR P63,64,67
A7073					V1	=	ENDBUF +1	2P	SHARED FOR TM. P64-P65
7074	REF	1		E7,1641	DLEWD	EQUALS	D +2	2P	
7076	REF	1		E7,1643	K2ROLL	EQUALS	DLEWD +2	2 P	
7077	REF	1		E7,1645	GOTOADDR	EQUALS	K2ROLL +2	1P	
7078	REF	1		E7,1646	TEM1B	EQUALS	GOTOADDR +1	2 P	
7079	REF	1		E7,1650	MM	EQUALS	TEM1B +2	2 P	
7060	REF	1		E7,1651	GRAD	EQUALS	MM +1	1P	
7081	REF	1		E7,1652	FX	EQUALS	GRAD +1	1P	OVERWRITES NEXT 5 LOCS IN P67.
7082	REF	1		E7,1653	LEQ	EQUALS	FX +1	2P	
7083	REF	1		E7,1655	DHOOK	EQUALS	LEQ +2	2P	
7084	REF	1		E7,1657	AHOOKDV	EQUALS	DHOOK +2	2P	

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 7085   REF   1                E7,1661     DVL      EQUALS AHOOKDV +2      2P
A7088                                      AO       =      ENDBUF +3       2P   SHARED FOR TM.(HI-WD ) P64-P65
 7089   REF   1                E7,1663     A1       EQUALS DVL     +2      2P
 7090   REF   1                E7,1665     VBARS    EQUALS A1 +2           2P
 7091   REF   1                E7,1667     COSG/2   EQUALS VBARS +2        2P
A7092                                      GAMMAL   =      GAMMAEI         2P   SHARED FOR TM  P64
 70921                    0026             GAMMAL1  =      22D             2P
 7093   REF   1                E7,1671     VSI      EQUALS COSG/2  +2      2P
 7094   REF   1                E7,1766     VL       =      VPRED           2P   SHARED FOR TM   P64-P65
 7095   REF   1                E7,1673     V        EQUALS VSI     +2      2P
A7096                                      VREF     =      THETAD   +2     2P   SHARED FOR TM    P65
 70961  REF   1                E7,1675     LATANG   EQUALS V       +2      2P   ADJACENT FOR TM.
 7097   REF   1                E7,1677     RDOT     EQUALS LATANG  +2      2P   ADJACENT FOR TM.
 70971  REF   1                E7,1701     THETAH   EQUALS RDOT    +2      2P   DSP NOUN 64,67 FOR P63,64,67
A7098                                      RDOTREF  =      THETAD          2P   SHARED FOR TM     P65
 7099   REF   1                E7,1703     ALP      EQUALS THETAH  +2      2P

 7100   REF   1                E7,1730     ASKEP    =      ASPS            2P)                  THESE ARE STORED IN
 7101   REF   2  LAST  116     E7,1731     ASP1     =      ASPS    +1      2P)                  SEQUENCE,OVERLAPPING
 7102   REF   3  LAST  116     E7,1732     ASPUP    =      ASPS    +2      2P)>HI-WD OF EACH<   HI-WORD ONLY APPEARS
 7103   REF   4  LAST  116     E7,1733     ASPDWN   =      ASPS    +3      2P)                  ON DOWNLIST, EXCEPT
 7104   REF   5  LAST  116     E7,1734     ASP3     =      ASPS    +4      2P)                  ASP3 IS COMPLETE.

 7105   REF   1                E7,1705     C/DO     EQUALS ALP     +2      2P   -1/DO
 7106   REF   1                E7,1707     DO       EQUALS C/DO    +2      I(2)    CONSTANT DRAG
 7107   REF   1                E7,1711     Q2       EQUALS DO      +2      2P
A7108
R7109                RCLLC IS LOCATED IN EBANK= ACG TO AID ENTRY DAP.
 7110   REF   1                E7,1713     RTGO     EQUALS Q2      +2      2P   DSP NOUN 66 FOR P64,P67.
 7111   REF   1                E7,1715     DNRNGERR EQUALS RTGO    +2      2P DSP NOUN 66 FOR P64,67.
 71111  REF   2  LAST  116     E7,1675     XRNGERR  =      LATANG          FOR DISKY DISPLAY
 7112   REF   1                E7,1717     KAT      EQUALS DNRNGERR +2     2P
 7113   REF   1                E7,1721     GMAX     EQUALS KAT     +2      1P  DSP NOUN 60 FOR P61,62,63.
A7114                                                                     GMAX IS LOADED IN  DOUBLE PRECISION
 71141  REF   1                E7,1726     L/DCALC  =      TTE             2P  CALCULATED L/D FOR TM:  P64 - P67.
 71151  REF   1                E7,1770     GAMMAL   =      GAMMAEI         2P  SHARED FOR TM   P64
 7116   REF   2  LAST  116     E7,1770     PREDANG  =      GAMMAEI             FOR TM IN P67.
 7117   REF   1                E7,1771     JJ       =      PREDANG +1          FOR TM IN P67.
 7118   REF   1                E7,1722     VMAGI    EQUALS GMAX    +1      2P DSP NOUN 62,64,68 FOR P11,63,64.
 7119   REF   1                E7,1724     VIO      EQUALS VMAGI   +2      2P  DSP NOUN 63 FOR P61.
 7120   REF   2  LAST  115     E7,1726     TTE      EQUALS VIO     +2      2P  DSP NOUN 63 FOR P61.

 712005 REF   2  LAST  116     E7,1730     ASPS     EQUALS TTE      +2     I(2)     HI-WORD ONLY ON DNLIST FOR TEMP
 712006 REF   6  LAST  116     E7,1732     TTE1     EQUALS ASPS     +2     I(2ETMP HOLDS UNDECREMENTED TTE VALUE

R71201               **** P60$ ****

 71202  REF   2  LAST  116     E7,1713     RTGON64  EQUALS RTGO            RANGE ERRORS NEGATIVE IF FALLS SHORT
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71203 REF 3 LAST 116 E7,1713 RTGON67 EQUALS RTGO DSP NOUN 67
A71204

R71205 REENTRY, RETURN TO EARTH COMMON DISPLAY. (4D)

71207 REF 1 E7,1766 VPRED EQUALS BETA12 +2 DSP NOUN 60 FOR P61, ,62,63.
71208 REF 2 LAST 116 E7,1770 GAMMAEI EQUALS VPRED +2 DSP NOUN 60 FOR P61, ,62,63.
A71209

R7121 SCME P11 DISPLAY REGISTERS. (6D)

7123 REF 1 E7,1734 ALTI EQUALS TTE1 +2 2P DSP NOUN 62 FOR P11.
7124 REF 1 E7,1736 HDOT EQUALS ALTI +2 2P DSP NOUN 62 FOR P11.
A71241

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P7130           *-*-*-*-  OVERLAY 2 IN EBANK 7 -*-*-*-*

R7131           KALCMANU STORAGE.                                       (18D)

 7133   REF  2  LAST 114   E7,1425          MFS       EQUALS END-DELV          I(18)
 7134   REF  1              E7,1425          MFI       EQUALS MFS               I   TMP
 7136   REF  2  LAST 118   E7,1425          DEL       EQUALS MFS               I   TMP
 7138   REF  3  LAST 118   E7,1447          END-KALC  EQUALS MFS      +18D     **NEXT AVAIL LOC AFTER KALCMANU **

R7139           MEASUREMENT INCORPORATION STORAGE(R22) STORAGE.          (56D)

 7141   REF  2  LAST 114   E7,1447          TX789     EQUALS END-KALC          I(6)TMP
 7142   REF  1              E7,1455          GAMMA     EQUALS TX789     +6      I(2)TMP
 7143   REF  1              E7,1457          OMEGA     EQUALS GAMMA     +2      I(18)TMP
 7144   REF  1              E7,1501          BVECTOR   EQUALS OMEGA     +18D    I(18)TMP
 7145   REF  1              E7,1523          DELTAQ    EQUALS BVECTOR   +18D    I(2)TMP
 7146   REF  1              E7,1525          VARIANCE  EQUALS DELTAQ +2         I(3)TMP
 7147   REF  1              E7,1530          RCLP      EQUALS VARIANCE  +3      I(6)TMP
 7148   REF  1              E7,1536          GRP2SVQ   EQUALS RCLP      +6      I(1)TMP QSAVE FOR RESTARTS

R7149           P20, P22, P23 DSP NOUN                                   (5D)

 7151   REF  2  LAST 118   E7,1501          N49DISP   EQUALS BVECTOR           B(5)TMP

R7154           S22.1 STORAGE.                                           (36D)

 7156   REF  1              E7,1537          SVMRKDAT  EQUALS GRP2SVQ  +1       I(36)TMP 5 SETS OF MARK DATA +PAD OF ONE

R7162           **** CISLUNAR NAV. ERAS. (P20S) ****                     (57D).

 7164   REF  1              E7,1603          TRUNX     EQUALS SVMRKDAT +36D
71641   REF  1              E7,1603          DATATEST  EQUALS TRUNX             (1)
 7165   REF  2  LAST 118   E7,1604          UBAR0     EQUALS TRUNX +1
 7166   REF  1              E7,1612          UBAR1     EQUALS UBAR0 +6
 7167   REF  1              E7,1620          UBAR2     EQUALS UBAR1 +6
 7168   REF  1              E7,1626          RZC       EQUALS UBAR2 +6
 7169   REF  1              E7,1634          VZC       EQUALS RZC +6
 7170   REF  1              E7,1642          UCLSTAR   EQUALS VZC +6
 7171   REF  1              E7,1650          USSTAR    EQUALS UCLSTAR +6
 7172   REF  1              E7,1656          RCLL      EQUALS USSTAR +6
 7174   REF  1              E7,1664          RL        EQUALS RCLL +6
 7176   REF  1              E7,1672          SRRETURN  EQUALS RL        +6
A7177
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P7192            *-*-*-*-  OVERLAY 3 IN EBANK 7 -*-*-*-*

R7193            RENDEZVOLS GUIDANCE STCRAGE.  - P32...P35 -                (8D)

 7195  REF  3 LAST 118  E7,1447          DELTEEO  EQUALS END-KALC        I(2) S-S BACK VALUES OF DELTA TIME
 7196  REF  1           E7,1451          DELEL    EQUALS DELTEEO  +2     I(2) S-S
 7197  REF  1           E7,1453          SECMAX   EQUALS DELEL    +2     I(2) S-S MAX STOP SIZE FOR ROUTINE
 7198  REF  1           E7,1455          XXXALT   EQUALS SECMAX   +2     I(2)
A7199


R7200            S40.9 STCRAGE.                                            (16D)

 7202  REF  1           E7,1457          VG       EQUALS XXXALT   +2     I(6)TMP
 7203  REF  1           E7,1465          VRPREV   EQUALS VG       +6     I(6)
 7204  REF  1           E7,1473          TNIT     EQUALS VRPREV   +6     I(2)
 7205  REF  1           E7,1475          TNITPREV EQUALS TNIT     +2     I(2)


R7206            S40.2,3 STCRAGE.                                          (1D)

 7208  REF  1           E7,1477          AXISCODE EQUALS TNITPREV +2     I(1)IN


R72085           P30'S-P17 COMMON STORAGE.                                 (24D)

 7210  REF  2 LAST 118  E7,1537          RACT3    EQUALS GRP2SVQ  +1     I(6)TMP POSITION OF ACTIVE AT TPI TIME.
 7211  REF  1           E7,1545          VACT3    EQUALS RACT3    +6     I(6)TMP VELOCITY OF ACTIVE AT  TPI TIME.
 7212  REF  1           E7,1553          RPASS3   EQUALS VACT3    +6     I(6)TMP POSITION OF PASSIVE AT TPI TIME.
 7213  REF  1           E7,1561          VPASS3   EQUALS RPASS3   +6     I(6)TMP VELOCITY OF PASSIVE AT TPI TIME.


R72131           P76, N84 DISPLAY                                          (6D)

 72133 REF  2 LAST 119  E7,1537          DELVOV   EQUALS RACT3            I(6)DSP NOUN 84 FOR X-V84, P34-35
A72134

R7214            INITVEL/MIDGIM STORAGE.                                   (34D)
R7216                  (CALLED BY S34.1,2,  S35.1,2, AND S40.9)
R7217                  (CALLS LAMBERT, CONIC SUBROUTINES)

 7218  REF  1           E7,1567          RINIT    EQUALS VPASS3   +6     I(6)IN  ACTIVE VEHICLE RADIUS VECTOR
 7219  REF  1           E7,1575          VINIT    EQUALS RINIT    +6     I(6)IN  ACTIVE VEHICLE VELOCITY VECTOR
 7220  REF  1           E7,1603          RTARG1   EQUALS VINIT    +6     I(6)TMP SHIFTED RTARG
 7221  REF  1           E7,1611          VIPRIME  EQUALS RTARG1   +6     I(6)OUT   NEW VEL REQ AT INITIAL RADIUS
 7222  REF  1           E7,1617          VTPRIME  EQUALS VIPRIME  +6     I(6)OUT TOTAL VELOCITY AT DESIRED RADIUS
 7223  REF  1           E7,1625          +MGA     EQUALS VTPRIME  +6     I(2)DSP NOUN 45 FOR P30,34,35. +MID GIM.
 7224  REF  1           E7,1627          COZY4    EQUALS +MGA     +2     I(2)TMP COSINE OF ANGLE WHEN ROT STARTS

R7225    (THE FOLLOWING OVERLAYS MEASUREMENT INCORP AND CAN NOT SHARE WITH TPI
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 7227   REF   1                E7,1502          INTIME   EQUALS AXISCODE +3
 7228   REF   1                E7,1504          ITCTR    EQUALS INTIME   +2   I(1) TMP ITERATION COUNTER
 7229   REF   1                E7,1631          END-IN/M EQUALS COZY4    +2   **NEXT AVAIL LOC AFTER INITVEL/MIDGIM**

R7230           P34 AND P33 STORAGE.  (OVERLAYS INITVEL/MIDGIM)                (24D)

 7232   REF   2  LAST  119    E7,1567          VAPREC   EQUALS RINIT           I(6) S-S PREC VEC FOR NOM TPI TIME(ACT V
 7233   REF   2  LAST  119    E7,1575          RAPREC   EQUALS VINIT           I(6) S-S PREC VEC FOR NOM TPI TIME(ACT V
 7234   REF   2  LAST  119    E7,1611          VPPREC   EQUALS VIPRIME         I(6) S-S PREC VEC FOR NOM TPI TIME(PASS
 7235   REF   2  LAST  119    E7,1617          RPPREC   EQUALS VTPRIME         I(6) S-S PREC VEC FOR NOM TPI TIME(PASS
R7236

R7237           P30, P40 INTERFACE.                                            (20D)

 7239   REF   1                E7,1631          RTIG     EQUALS END-IN/M        I(6)TMP
 7240   REF   1                E7,1637          VTIG     EQUALS RTIG     +6     I(6)TMP
 7241   REF   1                E7,1645          DELVSIN  EQUALS VTIG     +6     I(6)TMP
 72414  REF   1                E7,1645          DELVEET3 EQUALS DELVSIN         TMP DELTA VEL VECT INERTIAL COORDS.
 72416  REF   1                E7,1645          VGTEMP   EQUALS DELVEET3
 7242   REF   2  LAST  120    E7,1653          DELVSAB  EQUALS DELVSIN  +6     I(2)TMP
 7243   REF   1                E7,1653          VGDISP   =      DELVSAB         DSP NOUN 40,42,99FOR P30,34,35,40,41

R7244           P35-P40 INTERFACE STORAGE. (OVERLAYS P30-P40 I/F STORAGE)      (12D)

 7246   REF   2  LAST  120    E7,1631          RPASS4   EQUALS RTIG            I(6)TMP POSITION OF PASSIVE AT INTERCEPT
 7247   REF   1                E7,1637          VPASS4   EQUALS RPASS4   +6     I(6)TMP VELOCITY OF PASSIVE AT INTERCEPT

R72472          TPI SEARCH (P17)                                               (6D)

 72476  REF   1                E7,1645          E2       EQUALS VPASS4   +6     I(6)TMP
A72478

R7248           P30-P40 COMMON STORAGE.                                        (3D)

 7250   REF   2  LAST  120    E7,1655          TPASS4   EQUALS DELVSAB  +2     I(2)TMP
 7251   REF   1                E7,1655          TINT     =      TPASS4          I(2)
 7254   REF   2  LAST  120    E7,1657          QTEMP    EQUALS TPASS4   +2     I(1) TMP
A72545

R7255           P30-P40 STORAGE.                                               (4D)

 7257   REF   1                E7,1660          TTOGO    EQUALS QTEMP    +1     B(2)DSP NOUN 35,40,45,59,99
A7258                                                                                 FOR P30,34,35,40,41,47,  R30.
 7259   REF   1                E7,1662          TTPI     EQUALS TTOGO    +2     B(2)DSP NOUN 37 FOR P34 TPI TIME, CSECS.
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 7260   REF   1                E7,1664          END-P30S EQUALS TTPI      +2      **NEXT AVAIL LOC AFTER P30-40 STORAGE.**

R7261           P40 STORAGE.                                                       (8D)

 7263   REF   1                E7,1664          VGBODY   EQUALS END-P30S         B(6)DSP NOUN 85 FOR P40,41,42 VG-SC COOR
 7264   REF   1                E7,1664          DELVCTL  =       VGBODY
 7265   REF   2  LAST  121     E7,1672          P40TMP   EQUALS VGBODY    +6      B(2)TMP

R7266           P47 STORAGE.

 7267   REF   2  LAST  119     E7,1457          DV47TEMP EQUALS VG
 7268   REF   3  LAST   32     E7,1674          DELVIMU  EQUALS P40TMP    +2      I(6)  DSP  NOUN 83 FOR P47 DELTAV(IMU)
A72685

R7269           S40.1 STORAGE.                                                     (23D)

 7271   REF   1                E7,1702          CSTEER   EQUALS DELVIMU   +6      I(2)IN
 7273   REF   1                E7,1704          BDT      EQUALS CSTEER    +2      I(6)IN
 7274   REF   1                E7,1712          UT       EQUALS BDT       +6      I(6)OUT THRUST DIRECTION
 7275   REF   1                E7,1720          VGTIG    EQUALS UT        +6      I(6)OUT
 7276   REF   1                E7,1720          VGPREV   =       VGTIG
 7277   REF   2  LAST  121     E7,1726          F        EQUALS VGTIG     +6      I(2)OUT S40.3 NEEDS THIS
 7278   REF   1                E7,1730          QTEMP1   EQUALS F         +2      I(1)TMP HOLDS RETURN
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P7279           *-*-*-*-  OVERLAY 4 IN EBANK 7 -*-*-*-*-

R7280           S35.1 STORAGE.                                          (2D)

 7282  REF  2 LAST 121  E7,1664          TSTRT    EQUALS END-P30S       I(2)IN  MIDCOURSE START TIME

R7283           S34.1 STORAGE.          (OVERLAYS S35.1 STORAGE)        (1D)

 7285  REF  1           E7,1664          TITER    EQUALS TSTRT          I(1)TMP ITERATION COUNTER

R7286           (P30-31 Q-SAVES)                                        (1)

 7288  REF  1           E7,1664          P30/31RT EQUALS TITER          B(1)  RETURN POINT
A7289

R7290           P20'S(COLOSSUS) STORAGE.                                (6D)

 7292  REF  2 LAST 122  E7,1666          S22WUNL  EQUALS TSTRT    +2    1       WUNL W8 UNKNOWN INIT VALUE
 7294  REF  1           E7,1667          S22TOFF  EQUALS S22WUNL  +1    2     T SUB OFF
 7295  REF  1           E7,1671          S22TPRIM EQUALS S22TOFF +2     2       SAVE TF
 7296  REF  1           E7,1673          S22EORM  EQUALS S22TPRIM +2    0 = EARTH -- NON-ZERO = MOON
A7297

R7298           DOWNLINK ERASABLES FOR P22,P20 MARK DATA.               (8D)

 7300  REF  1           E7,1674          MARKDOWN EQUALS S22EORM  +1    B(1)
 7301  REF  1           E7,1703          RM       EQUALS S22RTNEX       DOWNLINK OF VHF RANGE
A7302

R7303           S22.1                                                   (1D)

 7305  REF  3 LAST  32  E7,1703          S22RTNEX EQUALS MARKDOWN +7    B(1)
A7306

R7307           CRS61.1 STORAGE.        -A SUBSET OF P20-               (14D)

 7309  REF  1           E7,1704          Q611     EQUALS RM       +1    I(1) TMP QSAVE
 7310  REF  1           E7,1705          Q6111    EQUALS Q611     +1    I(1)TMP QSAVE
 7311  REF  1           E7,1706          SAVEPOS  EQUALS Q6111    +1    I(6)TMP LEM POSITION VECTOR-
 7312  REF  1           E7,1714          SAVEVEL  EQUALS SAVEPOS  +6    I(6)TMP LEM VELOCITY VECTOR-

R7313           ATTITUDE MANEUVER -CALLED BY P20,R61,R63,CRS61.1        (3D)
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 7315   REF   1              E7,1722          PRAXIS    EQUALS SAVEVEL  +6     B(3) S-S DISP RES FOR PREF AXIS N95

R7316           MARK ROUTINE (R21) STORAGE.        -IS SUBSET OF R22-          (14D)

 7318   REF   1              E7,1725          MRKBUF1   EQUALS PRAXIS   +3     B(7)TMP R21 MARK BUFFER
 7319   REF   3 LAST   32    E7,1734          MRKBUF2   EQUALS MRKBUF1  +7     B(7)TMP R21 MARK BUFFER

R7320           MORE CONICS STORAGE.                                          (4)
 7322                        E7,1774          COGA      EQUALS 3774             I(2) COTAN OF INITIAL FLIGHT  PATH ANGLE
 7323   REF   1              E7,1774          INDEP     EQUALS COGA             I(1) USED BY SUBROUTINE:ITERATOR:
 7324   REF   2 LAST  123    E7,1776          EPSILONL  EQUALS COGA     +2     I(2) TMP
A7325

R7326           RENDEZVOUS GUIDANCE STORAGE.  - P32...P35 -                     (10D)

 7328   REF   1              E7,1743          ELEV      EQUALS MRKBUF2  +7     I(2)TMP
 7329   REF   1              E7,1745          RTX1      EQUALS ELEV     +2      (1)
 7330   REF   1              E7,1746          RTX2      EQUALS RTX1     +1      (1)
 7331   REF   1              E7,1747          RTMU      EQUALS RTX2     +1      (2)
 7332   REF   1              E7,1751          RTSR1/MU  EQUALS RTMU     +2      (2)
 7333   REF   1              E7,1753          CENTANG   EQUALS RTSR1/MU +2     I(2) S-S CENTRAL ANGLE COVERED(TPI-TPF)
A7334

R7335           TPI SEARCH(S17.1,S17.2) P17 STORAGE.                          (10D)

 7337   REF   2 LAST  123    E7,1743          DELTEE    EQUALS MRKBUF2  +7     I(2)
 7338   REF   1              E7,1745          XRS       EQUALS DELTEE   +2     I(2)
 7339   REF   1              E7,1747          THETL     EQUALS XRS      +2     I(2)
 7340   REF   1              E7,1751          TF        EQUALS THETL    +2     I(2)
 7341   REF   1              E7,1753          DELHITE   EQUALS TF       +2      (2)
```

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P703392 *-*-*-*- OVERLAY 5 IN EBANK 7 -*-*-*-*

R90005 P17,P34 (2D)

90007 REF 2 LAST 12C E7,1645 NN1 EQUALS DELVEET3 I(2) DSP NOUN 55,R1

R9001 ********** THE FOLLOWING ARE FOR FLIGHT 504 ONLY **********

R9002 RETURN-TO-EARTH STORAGE. (93D)

9004	REF	2	LAST 12C	E7,1631	RTEDVD	EQUALS END-IN/M	I(2)IN DELTA VELOCITY DESIRED	M/CS B7
9005	REF	1		E7,1633	RTEGAM2D	EQUALS RTEDVD +2	I(2)IN REENTRY ANGLE DESIRED	REVS B0
9006	REF	1		E7,1635	RCON	EQUALS RTEGAM2D +2	I(2)TMP CONIC R2 RADIUS	M B29
9007	REF	1		E7,1637	R(T1)/	EQUALS RCON +2	I(6)TMP POSITION VECTOR AT TIG	M B29/B27
9008	REF	1		E7,1645	R(T1)	EQUALS R(T1)/ +6	I(2)TMP MAGNITUDE OF R(T1)/	M B29/B27
9009	REF	1		E7,1647	DT21PR	EQUALS R(T1) +2	I(2) TMP PREVOUS DT21	CS B30
9010	REF	1		E7,1651	MAMAX1	EQUALS DT21PR +2	I(2) TMP MAJ AXIS LOW BOUND LMT	M B30
9011	REF	1		E7,1653	MAMAX2	EQUALS MAMAX1 +2	I(2) TMP MAJ AXIS UP BOUND LMT	M B30
9012	REF	1		E7,1655	R(T2)/	EQUALS MAMAX2 +2	I(6)TMP FINAL POSITION VECTOR	M B29/B27
9013	REF	1		E7,1663	RD	EQUALS R(T2)/ +6	I(2)TMP FINAL R DESIRED	M B29/B27
9014	REF	1		E7,1665	DRCON	EQUALS RD +2	I(2)TMP RCON SLOPE ITERATOR	M B29/B27
9015	REF	1		E7,1667	RPRE,	EQUALS DRCON +2	I(2)TMP PREVISOUS RPRE	M B29/B27
9016	REF	1		E7,1671	V(T1)/	EQUALS RPRE, +2	I(6)TMP VEL VECTOR AT TIG	M/CS B7/B5
9017	REF	1		E7,1677	V2(T1)/	EQUALS V(T1)/ +6	I(6)TMP POST IMP VEL AT TIG	M/CS B7/B5
9018	REF	1		E7,1705	DV	EQUALS V2(T1)/ +6	I(2)TMP DELTA VELOCITY AT TIG	M/CS B7/B5
9019	REF	1		E7,1707	V(T2)/	EQUALS DV +2	I(6)TMP FINAL VELOCITY VECTOR	M/CS B7/B5
9020	REF	1		E7,1715	T1	EQUALS V(T2)/ +6	I(2)TMP INITIAL VECTOR TIME	CS B28
9022	REF	1		E7,1717	PCON	EQUALS T1 +2	I(2)TMP SEMI-LATUS RECTUM	M B29
9023	REF	1		E7,1721	X(T1)	EQUALS PCON +2	I(2)TMP COTANGENT GAMMA1	B5
9024	REF	1		E7,1723	T12	EQUALS X(T1) +2	I(2)TMP INIT TO FINL POSIT TIME	CS B28
9025	REF	1		E7,1725	DELTAT	EQUALS T12 +2	I(2) TMP DELTA T IN SAFE PERILUNE	CS B28
9026	REF	1		E7,1727	NN1A	EQUALS DELTAT +2	I(2) TMP ITERATION COUNTER 1	
9027	REF	1		E7,1731	NN2	EQUALS NN1A +2	I(2) TMP ITERATION COUNTER 2	
9028	REF	1		E7,1733	RTENCKEX	EQUALS NN2 +2	I(1)TMP RTENCK RETURN ADDRESS	
9029	REF	1		E7,1734	CONICX1	EQUALS RTENCKEX +1	I(1)TMP CONICS MU TABLE INDEX	
9030	REF	1		E7,1735	T2	EQUALS CONICX1 +1	I(2)TMP FINAL TIME	CS B28
9031	REF	1		E7,1737	UR1/	EQUALS T2 +2	I(6)TMP UNIT R(T1)/	B1
9032	REF	1		E7,1745	UV1/	EQUALS UR1/ +6	I(6)TMP UNIT V(T1)/	B1
9033	REF	1		E7,1753	BETA1	EQUALS UV1/ +6	I(2)TMP 1+X(T2)**2	B1
9034	REF	1		E7,1755	P(T1)	EQUALS BETA1 +2	I(1)TMP PRIMARY BODY STATE TIME 1	B14
9036	REF	1		E7,1756	CFPA	EQUALS P(T1) +1	I(2) TMP COSINE FLIGHT PATH ANGLE	B1
9037	REF	1		E7,1760	PHI2	EQUALS CFPA +2	I(2) TMP PERI OR APO INDICATOR	B2
9038	REF	1		E7,1762	SPRTEX	EQUALS PHI2 +2	I(1)TMP ROUTINE RETURN ADDRESS	
9039	REF	1		E7,1763	VNSTORE	EQUALS SPRTEX +1	I(1)TMP VERBNOUN STORAGE	
9040	REF	1		E7,1764	BETA12	EQUALS VNSTORE +1	I(2)TMP SIGN FOR TIMERAD	

R9041 OVERLAYS WITHIN RETURN-TO-EARTH STORAGE.

9042	0030	RPRE	EQUALS 24D	I(2)TMP COMPUTED PREC RADIUS	M B29/B27

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```
 9043                          0032        P/RPRE   EQUALS 26D          I(2)TMP P/R                                  B4
 9044                          0034        R/APRE   EQUALS 28D          I(2)TMP R/A                                  B6
 9045  REF   2  LAST  124     E7,1723      X(T2)PRE EQUALS T12          I(2)TMP PREC COTAN GAMMA2                    B0
 9046  REF   2  LAST  124     E7,1725      X(T2)    EQUALS DELTAT       I(2)TMP COTAN GAMMA2                         B0
 9048  REF   2  LAST  124     E7,1745      UH/      EQUALS UV1/         I(2)TMP UNIT HORIZONTAL VECTOR.              B1
 9049  REF   2  LAST  114     E7,1412      SPRTETIG EQUALS TIG          I(2)IN  TIME OF IGNITION                  CS B28
 9050  REF   2  LAST   87     E4,1721      RETLOCN  EQUALS XRIHOLD +1
R9051

 9900                          E7,1777      WHOCARES =      3777        A DUMMY FOR E-BANK INSENSITIVE 2CADRS.

 9901  REF   1                 E7,1777      END-E7   EQUALS WHOCARES     ****** LAST LOCATION IN E7
```

*** END OF KILERASE.078 ***

L INTERRUPT LEAD INS USER'S PAGE NO. 1 EO 53

```
0001                          4000                    SETLOC 4000

0002   REF   1                                        COUNT  02/RUPTS

0003                          4000  0 0004 0          INHINT                 GO
0004   REF   1                4001  3 4054 1          CAF    GOBB
0005   REF   1                4002  56 006 1          XCH    BBANK
0006   REF   1                4003  1 2511 1          TCF    GOPROG

0007   REF   1                4004  52 011 0          DXCH   ARUPT           T6RUPT
0008                          4005  0 0006 1          EXTEND
0009   REF   1                4006  3 1311 0          DCA    T6LOC
0010                          4007  52 006 0          DTCB

0011   REF   2  LAST  126     4010  52 011 0          DXCH   ARUPT           T5RUPT
0012   REF   1                4011  4 0030 0          CS     TIME5
0013   REF   1                4012  6 4731 0          AD     .5SEC
0014   REF   1                4013  1 4065 1          TCF    T5RUPT

0015   REF   3  LAST  126     4014  52 011 0          DXCH   ARUPT           T3RUPT
0016   REF   1                4015  3 4055 0          CAF    T3RPTBB
0017   REF   2  LAST  126     4016  56 006 1          XCH    BBANK
0018   REF   1                4017  1 3416 0          TCF    T3RUPT

0019   REF   4  LAST  126     4020  52 011 0          DXCH   ARUPT           T4RUPT
0020   REF   1                4021  3 4063 0          CAF    T4RPTBB
0021   REF   3  LAST  126     4022  56 006 1          XCH    BBANK
0022   REF   1                4023  1 2000 1          TCF    T4RUPT

0023   REF   5  LAST  126     4024  52 011 0          DXCH   ARUPT           KEYRUPT1
0024   REF   1                4025  3 4056 0          CAF    KEYRPTBB
0025   REF   4  LAST  126     4026  56 006 1          XCH    BBANK
0026   REF   1                4027  1 3613 1          TCF    KEYRUPT1

0027   REF   6  LAST  126     4030  52 011 0          DXCH   ARUPT           KEYRUPT2
0028   REF   1                4031  3 4057 1          CAF    MKRUPTBB
0029   REF   5  LAST  126     4032  56 006 1          XCH    BBANK
0030   REF   1                4033  1 2103 0          TCF    MARKRUPT

0031   REF   7  LAST  126     4034  52 011 0          DXCH   ARUPT           UPRUPT
0032   REF   1                4035  3 4056 0          CAF    UPRPTBB
0033   REF   6  LAST  126     4036  56 006 1          XCH    BBANK
0034   REF   1                4037  1 3636 0          TCF    UPRUPT

0035   REF   8  LAST  126     4040  52 011 0          DXCH   ARUPT           DOWNRUPT
0036   REF   1                4041  3 4060 0          CAF    DWNRPTBB
0037   REF   7  LAST  126     4042  56 006 1          XCH    BBANK
0038   REF   1                4043  1 3331 1          TCF    DODOWNTM

0039   REF   9  LAST  126     4044  52 011 0          DXCH   ARUPT           RADAR RUPT
```

```
0040   REF   1                    4045  3 4061 1          CAF    RDRPTBB
0041   REF   8  LAST  126         4046  56 006 1          XCH    BBANK
0042   REF   1                    4047  1 2476 1          TCF    VHFREAD

0043   REF  10  LAST  126         4050  52 011 0          DXCH   ARUPT          HAND CONTROL RUPT
0044   REF   1                    4051  3 4062 1          CAF    HCRUPTBB
0045   REF   9  LAST  127         4052  56 006 1          XCH    BBANK
0046   REF   1                    4053  1 5225 0          TCF    RESUME +3      NOT USED
0047   REF   1                E3,1400                     EBANK= LST1           RESTART USES EQ, E3
0048   REF   2  LAST  126         4054   12063 1  GOBB     BBCON  GOPROG

0049   REF   2  LAST  127      E3,1400                     EBANK= LST1
0050   REF   2  LAST  126         4055   02063 0  T3RPTBB  BBCON  T3RUPT

0051   REF   1                    0073                     EBANK= KEYTEMP1
0052   REF   2  LAST  126         4056   16060 0  KEYRPTBB BBCON  KEYRUPT1

0053   REF   4  LAST  123      E7,1725                     EBANK= MRKBUF1
0054   REF   2  LAST  126         4057   16067 1  MKRUPTBB BBCON  MARKRUPT

0055   REF   2  LAST  126         4056            UPRPTBB  =      KEYRPTBB

0056   REF   1                    0340                     EBANK= DNTMBUFF
0057   REF   2  LAST  126         4060   12060 1  DWNRPTBB BBCON  DODOWNTM

0058   REF   1                E7,1603                     EBANK= DATATEST
0059   REF   2  LAST  127         4061   56067 0  RDRPTBB  BBCON  VHFREAD
0060   REF   1                    0025                     EBANK= TIME1
0061   REF   2  LAST  127         4062   04060 0  HCRUPTBB BBCON  RESUME         NOT USED
0062   REF   1                    1302                     EBANK= DSRUPTSW
0063   REF   2  LAST  126         4063   14062 0  T4RPTBB  BBCON  T4RUPT
0064   REF   2  LAST  127         0025                     EBANK= TIME1
0065   REF   2  LAST  126         4064   04060 0  T5RPTBB  BBCON  T5RUPT

0066                               4065  0 0006 1  T5RUPT   EXTEND
0067   REF   1                    4066  6 5226 1           BZMF   NOQBRSM
0068                               4067  0 0006 1           EXTEND
0069   REF   1                    4070  3 1313 1           DCA    T5LOC
0070                               4071  52 006 0           DTCB
```

L T4RUPT PROGRAM

```
0001                        12,2000                         BANK    12
0002   REF   1              06,2000                         SETLOC  T4RUP
0003                        06,2000                         BANK

0004   REF   1                                              COUNT   06/T4RPT

0005   REF   1              06,2000  54 016 1  T4RUPT       TS      BANKRUPT
0006                        06,2001  0 0006 1                EXTEND
0007   REF   1              06,2002  22 012 1                QXCH    QRUPT

0008   REF   2  LAST  127   06,2003  11'302 0                CCS     DSRUPTSW        GOES 7(-1)0 AROUND AND AROUND
0009   REF   1              06,2004  1 2010 0                TCF     NORMT4 +1
0010   REF   2  LAST  128   06,2005  1 2007 0                TCF     NORMT4

0011   REF   1              06,2006  1 2136 0                TCF     QUIKDSP

0012   REF   1              06,2007  3 4716 0  NORMT4        CAF     SEVEN
0013   REF   1              06,2010  54 070 1                TS      RUPTREG1
0014   REF   3  LAST  128   06,2011  55'302 0                TS      DSRUPTSW

0015   REF   1                                              COUNT   02/T4RPT

0016   REF   1                   7711                 74K   =       HIGH4
R0017  RELTAB IS A PACKED TABLE. RELAYWORD CODE IN UPPER 4 BITS, RELAY CODE
R0018  IN LOWER 5 BITS.

0019                        4072                            BLOCK   02
0020   REF   1              4000                            SETLOC  FFTAG12
0021                        4072                            BANK
0022                        4072     04025 1  RELTAB       OCT     04025
0023                        4073     10003 0                OCT     10003
0024                        4074     14031 0                OCT     14031
0025                        4075     20033 0                OCT     20033
0026                        4076     24017 1                OCT     24017
0027                        4077     30036 1                OCT     30036
0028                        4100     34034 1                OCT     34034
0029                        4101     40023 1                OCT     40023
0030                        4102     44035 1                OCT     44035
0031                        4103     50037 0                OCT     50037
0032                        4104     54000 0                OCT     54000
0033                        4105     60000 1  RELTAB11      OCT     60000
```

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P0034 SWITCHED-BANK PORTION.

```
0035                          12,2000                          BANK   12
0036  REF   2  LAST  128      06,2000                          SETLOC T4RUP
0037                          06,2012                          BANK

0038  REF   2 LAST  128 TO  128:    10    10*                 COUNT  06/T4RPT

0039  REF   1                 06,2012  11'036 1  CDRVE         CCS    DSPTAB +11D
0040  REF   1                 06,2013  0 2063 0               TC     DSPOUT
0041  REF   2  LAST  129      06,2014  0 2063 0               TC     DSPOUT

0042  REF   2  LAST  129      06,2015  57'036 0               XCH    DSPTAB +11D
0043  REF   1                 06,2016  7 4372 1               MASK   LOW11
0044  REF   3  LAST  129      06,2017  55'036 1               TS     DSPTAB +11D
0045  REF   1                 06,2020  6 4105 1               AD     RELTAB11
0046                          06,2021  0 0006 1               EXTEND
0047  REF   1                 06,2022  01 010 1               WRITE  OUT0
0048  REF   1                 06,2023  0 2071 0               TC     HANG20
```

P0049 DSPCLT PROGRAM. PUTS OUT DISPLAYS.

```
0050  REF  1                  06,2024  55'016 C  DSPOUTSB TS     NOUT
0051  REF  1                  06,2025  4 4714 C           CS     ZERO
0052  REF  1                  06,2026  54 073 1           TS     DSRUPTEM       SET TO -0 FOR 1ST PASS THRU DSPTAB
0053  REF  1                  06,2027  56 776 1           XCH    DSPCNT
0054  REF  1                  06,2030  6 4713 C           AD     NEGO           TO PREVENT +0
0055  REF  2  LAST  13C       06,2031  54 776 C           TS     DSPCNT
0056  REF  3  LAST  13C       06,2032  50 776 1  DSPSCAN  INDEX  DSPCNT
0057  REF  4  LAST  12S       06,2033  11'023 C           CCS    DSPTAB
0058  REF  4  LAST  13C       06,2034  10 776 C           CCS    DSPCNT         IF DSPTAB ENTRY +, SKIP
0059  REF  1                  06,2035  1 2030 1           TCF    DSPSCAN -2     IF DSPCNT +, AGAIN
0060  REF  1                  06,2036  1 2047 1           TCF    DSPLAY         IF DSPTAB ENTRY -, DISPLAY
0061                          06,2037   00012 1  TABLNTH  OCT    12             DEC 10   LENGTH OF DSPTAB
0062  REF  2  LAST  13C       06,2040  10 073 1           CCS    DSRUPTEM       IF DSRUPTEM=+0,2ND PASS THRU DSPTAB
0063                          06,2041   37764 C  120MRUPT DEC    16372          (DSPCNT = 0). +0 INTO NOUT.
0064  REF  2  LAST  13C       06,2042  55'016 C           TS     NOUT
0065  REF  2  LAST   38       06,2043  0 0002 C           TC     Q
0066  REF  3  LAST  13C       06,2044  54 073 1           TS     DSRUPTEM       IF DSRUPTEM=-0,1ST PASS THRU DSPTAB
0067  REF  1                  06,2045  3 2037 1           CAF    TABLNTH        (DSPCNT=0). +0 INTO DSRUPTEM. PASS AGAIN
0068  REF  2  LAST  13C       06,2046  1 2031 C           TCF    DSPSCAN -1

0069  REF  1                  06,2047  6 4712 1  DSPLAY   AD     ONE
0070  REF  5  LAST  13C       06,2050  50 776 1           INDEX  DSPCNT
0071  REF  5  LAST  13C       06,2051  55'023 C           TS     DSPTAB         REPLACE POSITIVELY
0072  REF  2  LAST  12S       06,2052  7 4372 1           MASK   LOW11          REMOVE BITS 12 TO 15
0073  REF  4  LAST  13C       06,2053  54 073 1           TS     DSRUPTEM
0074  REF  1                  06,2054  3 4364 1           CAF    HI5
0075  REF  6  LAST  13C       06,2055  50 776 1           INDEX  DSPCNT
0076  REF  1                  06,2056  7 4072 1           MASK   RELTAB         PICK UP BITS 12 TO 15 OF RELTAB ENTRY
0077  REF  5  LAST  13C       06,2057  6 0073 C           AD     DSRUPTEM
0078                          06,2060  0 0006 1           EXTEND
0079  REF  2  LAST  12S       06,2061  01 010 1           WRITE  OUTO           WRITE CHANNEL 10
0080  REF  1                  06,2062  1 6706 1           TCF    Q+1            ***NORMAL RETURN SKIPS ONE


0081  REF  1                  06,2063  10 101 C  DSPOUT   CCS    FLAGWRD5       DONT DISPLAY UNLESS DSKY FLAG ON
0082  REF  2  LAST  13C       06,2064  3 4714 1           CAF    ZERO
0083  REF  1                  06,2065  1 2132 1           TCF    NODSPOUT
0084  REF  3  LAST  13C       06,2066  11'016 C           CCS    NOUT
0085  REF  1                  06,2067  0 2024 C           TC     DSPOUTSB
0086  REF  2  LAST  13C       06,2070  1 2132 1           TCF    NODSPOUT       NO DISPLAY REQUESTS
0087  REF  1                  06,2071  4 2173 1  HANG20   CS     11,14,9
0088  REF  4  LAST  12E       06,2072  27'302 C           ADS    DSRUPTSW

0089  REF  1                  06,2073  3 7700 1           CAF    20MRUPT
0090  REF  1                  06,2074  54 027 C  SETTIME4 TS     TIME4
```

```
P0091   THE STATUS OF THE PROCEED PUSHBUTTON IS MONITORED EVERY 120 MILLISECONDS VIA THE CHANNEL 32 BIT 14 INBIT.
R0093   THE STATE OF THIS INBIT IS COMPARED WITH ITS STATE DURING THE PREVIOUS T4RUPT AND IS PROCESSED AS FOLLOWS.

R0095       IF PREV ON AND NOW ON    -   BYPASS
R0096       IF PREV ON AND NOW OFF   -   UPDATE IMODES33
R0097       IF PREV OFF AND NOW ON   -   UPDATE IMODES33 AND PROCESS VIA PINBALL
R0098       IF PREV OFF AND NOW OFF  -   BYPASS

R0099   THE LOGIC EMPLOYED REQUIRES ONLY 9 MCT (APPROX. 108 MICROSECONDS) OF COMPUTER TIME WHEN NO CHANGES OCCUR.


0101   REF   1              06,2075  3 1321 0  PROCEEDE CA     IMODES33        MONITIOR FOR PROCEED BUTTON
0102                        06,2076  0 0006 1           EXTEND
0103   REF   1              06,2077  06 032 0           RXOR    CHAN32          CHECK IF BIT 14 DIFFERENT
0104   REF  10  LAST  62    06,2100  7 4675 0           MASK    BIT14
0105                        06,2101  0 0006 1           EXTEND
0106   REF   1              06,2102  1 2116 1           BZF     T4JUMP          NO CHANGE

0107   REF   2  LAST 131    06,2103  23'321 0           LXCH    IMODES33
0108                        06,2104  0 0006 1           EXTEND
0109   REF   1              06,2105  06 001 0           RXOR    LCHAN
0110   REF   3  LAST 131    06,2106  55'321 1           TS      IMODES33        UPDATE IMODES33
0111   REF  11  LAST 131    06,2107  7 4675 0           MASK    BIT14
0112   REF   2  LAST  79    06,2110  10 000 0           CCS     A
0113   REF   2  LAST 131    06,2111  1 2116 1           TCF     T4JUMP          WAS ON - NOW OFF

0114   REF   1              06,2112  3 4371 0           CAF     CHRPRIO         WAS OFF - NOW ON
0115   REF   1              06,2113  0 5027 1           TC      NOVAC
0116   REF   1                 0777                    EBANK=  DSPCOUNT
0117   REF   1              06,2114   03353 1           2CADR   PROCKEY
0117   REF   1              06,2115   60101 1
```

P0118 JUMP TO APPROPRIATE ONCE-PER SECOND (.96 SEC ACTUALLY) ACTIVITY

```
0119   REF   2  LAST  128   06,2116  50 070 0  T4JUMP   INDEX  RUPTREG1
0120                       06,2117  1 2120 1           TCF    +1

0121   REF   1             06,2120  1 2130 0           TCF    OPTTEST
0122   REF   1             06,2121  1 2765 0           TCF    OPTMON
0123   REF   1             06,2122  1 2174 0           TCF    IMUMON
0124   REF   3  LAST  127   06,2123  1 5222 1           TCF    RESUME
0125   REF   2  LAST  132   06,2124  1 2130 0           TCF    OPTTEST
0126   REF   2  LAST  132   06,2125  1 2765 0           TCF    OPTMON
0127   REF   2  LAST  132   06,2126  1 2174 0           TCF    IMUMON
0128   REF   4  LAST  132   06,2127  1 5222 1           TCF    RESUME

0129   REF   1             06,2130  0 4633 0  OPTTEST  TC     IBNKCALL
0130   REF   1             06,2131   20000 0           CADR   OPTDRIVE

0131   REF   1               7700                20MRUPT  =      OCT37776       (DEC 16382)
0132                       06,2132  0 0006 1  NODSPOUT EXTEND                   TURN OFF RELAYS
0133   REF   3  LAST  130   06,2133  01 010 1           WRITE  OUT0

0134   REF   1             06,2134  3 2041 0           CAF    120MRUPT       SET FOR NEXT CORVE
0135   REF   1             06,2135  1 2074 1           TCF    SETTIME4

0136   REF  12  LAST  131   06,2136  3 4675 1  QUIKDSP  CAF    BIT14
0137   REF   5  LAST  130   06,2137  7 1302 0           MASK   DSRUPTSW
0138                       06,2140  0 0006 1           EXTEND
0139   REF   1             06,2141  1 2167 1           BZF    QUIKOFF        WROTE LAST TIME, NOW TURN OFF RELAYS.

01395  REF   4  LAST  130   06,2142  11*016 0           CCS    NOUT
0140   REF   2  LAST  130   06,2143  0 2024 0           TC     DSPOUTSB
0141   REF   1             06,2144  1 2154 1           TCF    NODSPY         NOUT=0 OR BAD RETURN FROM DSPOUTSB
0142   REF  13  LAST  132   06,2145  4 4675 0           CS     BIT14          GOOD RETURN (WE DISPLAYED SOMETHING)
0143   REF   6  LAST  132   06,2146  27*302 0  QUIKRUPT ADS    DSRUPTSW

0144   REF   2  LAST  130   06,2147  3 7700 1           CAF    20MRUPT
0145   REF   2  LAST  130   06,2150  54 027 0           TS     TIME4

0146   REF  11  LAST   61   06,2151  3 4702 0           CAF    BIT9
0147   REF   7  LAST  132   06,2152  27*302 0           ADS    DSRUPTSW

0148   REF   5  LAST  132   06,2153  0 5222 0           TC     RESUME

0149                       06,2154  0 0006 1  NODSPY   EXTEND
0150   REF   4  LAST  132   06,2155  01 010 1           WRITE  OUT0

0151   REF   3  LAST  132   06,2156  3 7700 1  SYNCT4   CAF    20MRUPT
0152   REF   3  LAST  132   06,2157  26 027 0           ADS    TIME4

0153   REF  12  LAST  132   06,2160  3 4702 0           CAF    BIT9
```

```
0154   REF   8  LAST  132   06,2161  27'302 C            ADS     DSRUPTSW
0155   REF   9  LAST  133   06,2162  11'302 C            CCS     DSRUPTSW
0156   REF   6  LAST  132   06,2163  0 5222 C            TC      RESUME
0157                        06,2164   37737 C  OCT37737  OCT     37737
0158   REF   1              06,2165  0 2156 1            TC      SYNCT4
0159   REF   7  LAST  133   06,2166  0 5222 C            TC      RESUME

0160                        06,2167  0 0006 1  QUIKOFF   EXTEND
0161   REF   5  LAST  132   06,2170  01 010 1            WRITE   OUTO
0162   REF  14  LAST  132   06,2171  3 4675 1            CAF     BIT14          RESET DSRUPTSW TO SEND DISPLAY NEXT PASS
0163   REF   1              06,2172  1 2146 1            TCF     QUIKRUPT

0164                        06,2173   22400 C  11,14,9   OCT     22400
```

```
R0165   PROGRAM NAME:  IMUMON

R0166   FUNCTIONAL DESCRIPTION:  THIS PROGRAM IS ENTERED EVERY 480 MS.  IT DETECTS CHANGES OF THE IMU STATUS BITS IN
R0168   CHANNEL 30 AND CALLS THE APPROPRIATE SUBROUTINES.  THE BITS PROCESSED AND THEIR RELEVANT SUBROUTINES ARE:

R0170           FUNCTION                BIT     SUBROUTINE CALLED
R0171           --------                ---     -----------------
R0172           TEMP IN LIMITS           15     TLIM
R0173           ISS TURN-ON REQUEST      14     ITURNON
R0174           IMU FAIL                 13     IMUFAIL (SETISSW)
R0175           IMU CDU FAIL             12     ICDUFAIL (SETISSW)
R0176           IMU CAGE                 11     IMUCAGE
R0177           IMU OPERATE               9     IMUOP

R0178           THE LAST SAMPLED STATE OF THESE BITS IS LEFT IN IMODES30.  ALSO, EACH SUBROUTINE CALLED FINDS THE NEW
R0180   VALUE OF THE BIT IN A, WITH Q SET TO THE PROPER RETURN LOCATION, NXTIFAIL.

R0182   CALLING SEQUENCE:  T4RUPT EVERY 480 MILLISECONDS.

R0183   JOBS OR TASKS INITIATED:  NONE.

R0184   SUBROUTINES CALLED:  TLIM, ITURNON, SETISSW, IMUCAGE, IMUOP.

R0185   ERASABLE INITIALIZATION:
R0186           FRESH START OR RESTART WITH NO GROUPS ACTIVE: C(IMODES30) = OCT 37411.
R0188           RESTART WITH ACTIVE GROUPS: C(IMODES30) = (B(IMODES30)AND(OCT 00035)) PLUS OCT 37400.
R0190                                       THIS LEAVES IMU FAIL BITS INTACT.

R0191   ALARMS:  NONE.

R0192   EXIT:  TNONTEST.

R0193   OUTPUT:  UPDATED IMODES30 WITH CHANGES PROCESSED BY APPROPRIATE SUBROUTINE.

 0195   REF  1                  06,2174  3 1320 1  IMUMON   CA      IMODES30        SEE IF THERE HAS BEEN A CHANGE IN THE
 0196                           06,2175  0 0006 1           EXTEND                  RELEVANT BITS OF CHAN 30.
 0197   REF  1                  06,2176  06 030 1           RXOR    CHAN30          CHECK IF BITS 9,11-15 CHANGED
 0198   REF  1                  06,2177  7 2743 1           MASK    30RDMSK
 0199                           06,2200  0 0006 1           EXTEND
 0200   REF  1                  06,2201  1 2231 1           BZF     TNONTEST        NO CHANGE IN STATUS.

 0201   REF  3  LAST  132       06,2202  54 070 1           TS      RUPTREG1        SAVE BITS WHICH HAVE CHANGED.
 0202   REF  2  LAST  134       06,2203  23'320 1           LXCH    IMODES30        UPDATE IMODES30.
 0203                           06,2204  0 0006 1           EXTEND
 0204   REF  2  LAST  131       06,2205  06 001 0           RXOR    LCHAN
 0205   REF  3  LAST  134       06,2206  55'320 0           TS      IMODES30

 0206   REF  2  LAST  130       06,2207  4 4712 0           CS      ONE
 0207   REF  4  LAST  134       06,2210  56 070 0           XCH     RUPTREG1
 0208                           06,2211  0 0006 1           EXTEND
```

```
0209  REF   1                  06,2212  6 2507 1          BZMF   TLIM          CHANGE IN IMU TEMP.
0210  REF   1                  06,2213  1 2215 1          TCF    NXTIFBIT      BEGIN BIT SCAN.

0211  REF   3  LAST  134       06,2214  6 4712 1  -1      AD     ONE           (RE-ENTERS HERE FROM NXTIFAIL.)
0212  REF   5  LAST  134       06,2215  24 070 0  NXTIFBIT INCR   RUPTREG1      ADVANCE BIT POSITION NUMBER.
0213                            06,2216  6 0000 1  +1      DOUBLE
0214  REF   3  LAST  131       06,2217  54 000 0          TS     A             SKIP IF OVERFLOW.
0215  REF   2  LAST  135       06,2220  1 2215 1          TCF    NXTIFBIT      LOOK FOR BIT.

0216  REF   1                  06,2221  56 071 1          XCH    RUPTREG2      SAVE OVERFLOW-CORRECTED DATA.
0217  REF   6  LAST  135       06,2222  50 070 0          INDEX  RUPTREG1      SELECT NEW VALUE OF THIS BIT.
0218  REF  15  LAST  133       06,2223  3 4675 1          CAF    BIT14
0219  REF   4  LAST  134       06,2224  7 1320 0          MASK   IMODES30
0220  REF   7  LAST  135       06,2225  50 070 0          INDEX  RUPTREG1
0221  REF   1                  06,2226  0 2737 0          TC     IFAILJMP

0222  REF   2  LAST  135       06,2227  10 071 0  NXTIFAIL CCS    RUPTREG2      PROCESS ANY ADDITIONAL CHANGES.
0223  REF   3  LAST  135       06,2230  1 2214 0          TCF    NXTIFBIT -1
```

P0224 PROGRAM NAME: TNONTEST.

R0225 FUNCTIONAL DESCRIPTION: THIS PROGRAM HONORS REQUESTS FOR ISS INITIALIZATION. ISS TURN-ON (CHANNEL 30 BIT 14)
R0227 AND ISS OPERATE (CHANNEL 30 BIT 9) REQUESTS ARE TREATED AS A PAIR AND PROCESSING TAKES PLACE .480 SECONDS
R0229 AFTER EITHER ONE APPEARS. THIS INITIALIZATION TAKES ON ONE OF THE FOLLOWING THREE FORMS:

R0231 1) ISS TURN-ON: IN THIS SITUATION THE COMPUTER IS OPERATING WHEN THE ISS IS TURNED ON. NOMINALLY,
R0233 BOTH ISS TURN-ON AND ISS OPERATE APPEAR. THE PLATFORM IS CAGED FOR 90 SECONDS AND THE ICDU'S ZEROED
R0235 SO THAT AT THE END OF THE PROCESS THE GIMBAL LOCK MONITOR WILL FUNCTION PROPERLY.

R0237 2) ICDU INITIALIZATION: IN THIS CASE THE COMPUTER WAS PROBABLY TURNED ON WITH THE ISS IN OPERATE OR
R0239 A FRESH START WAS DONE WITH THE ISS IN OPERATE. IN THIS CASE ONLY ISS OPERATE IS ON. THE ICDU'S ARE
R0241 ZEROED SO THE GIMBAL LOCK MONITOR WILL FUNCTION. AN EXCEPTION IS IF THE ISS IS IN GIMBAL LOCK AFTER
R0243 A RESTART, THE ICDU'S WILL NOT BE ZEROED.

R0244 3) RESTART WITH RESTARTABLE PROGRAM USING THE IMU: IN THIS CASE, NO INITIALIZATION TAKES PLACE SINCE
R0246 IT IS ASSUMED THAT THE USING PROGRAM DID THE INITIALIZATION AND THEREFORE T4RUPT SHOULD NOT INTERFERE.

R0248 IMODES30 BIT 7 IS SET = 1 BY THE FIRST BIT (CHANNEL 30 BIT 14 OR 9) WHICH ARRIVES. FOLLOWING THIS, TNONTEST IS
R0250 ENTERED, FINDS BIT 7 = 1 BUT BIT 8 = 0, SO IT SETS BIT 8 = 1 AND EXITS. THE NEXT TIME IT FINDS BIT 8 = 1 AND
R0252 PROCEEDS, SETTING BITS 8 AND 7 = 0. AT PROCTNON, IF ISS TURN-ON REQUEST IS PRESENT, THE ISS IS CAGED (ZERO +
R0254 COARSE). IF ISS OPERATE IS NOT PRESENT PROGRAM ALARM 00213 IS ISSUED. AT THE END OF A 90 SECOND CAGE, BIT 2
R0256 OF IMODES30 IS TESTED. IF IT IS = 1, ISS TURN-ON WAS NOT PRESENT FOR THE ENTIRE 90 SECONDS. IN THAT CASE, IF
R0258 THE ISS TURN-ON REQUEST IS PRESENT THE 90 SECOND WAIT IS REPEATED, OTHERWISE NO ACTION OCCURS UNLESS A PROGRAM
R0260 WAS WAITING FOR THE INITIALIZATION IN WHICH CASE THE PROGRAM IS GIVEN AN IMUSTALL ERROR RETURN. IF THE DELAY
R0262 WENT PROPERLY, THE ISS DELAY OUTBIT IS SENT AND THE ICDU'S ZEROED. A TASK IS INITIATED TO REMOVE THE PIPA FAIL
R0264 INHIBIT BIT IN 10.24 SECONDS. IF A MISSION PROGRAM WAS WAITING IT IS INFORMED VIA ENDIMU.

R0266 AT PROCTNON, IF ONLY ISS OPERATE IS PRESENT (OPONLY), THE CDU'S ARE ZEROED UNLESS THE PLATFORM IS IN COARSE
R0268 ALIGN (= GIMBAL LOCK HERE) OR A MISSION PROGRAM IS USING THE IMU (IMUSEFLG = 1).

R0270 CALLING SEQUENCE: T4RUPT EVERY 480 MILLISECONDS AFTER IMUMON.

R0271 JOBS OR TASKS INITIATED: 1) ENDTNON, 90 SECONDS AFTER CAGING STARTED. 2) ISSUP, 4 SECONDS AFTER CAGING DONE.
R0273 3) PFAILOK, 10.24 SECONDS AFTER INITIALIZATION COMPLETED. 4) UNZ2, 320 MILLISECONDS AFTER ZEROING
R0275 STARTED.

R0276 SUBROUTINES CALLED: CAGESUB, CAGESUB2, ZEROICDU, ENDIMU, IMUBAD, NOATTOFF, SETISSW, VARDELAY.

R0278 ERASABLE INITIALIZATION: SEE IMUMON.

R0279 ALARMS: PROGRAM ALARM 00213 IF ISS TURN-ON REQUESTED WITHOUT ISS OPERATE.

R0281 EXIT: ENDTNON EXITS TO C33TEST. TASKS HAVING TO DO WITH INITIALIZATION EXIT AS FOLLOWS: MISSION PROGRAM
R0283 WAITING AND INITIALIZATION COMPLETE, EXIT TO ENDIMU, MISSION PROGRAM WAITING AND INITIALIZATION FAILED, EXIT TO
R0285 IMUBAD, IMU NOT IN USE, EXIT TO TASKOVER.

R0286 OUTPUT: ISS INITIALIZED.

0287 REF 5 LAST 135 06,2231 4 1320 C TNONTEST CS IMODES30 AFTER PROCESSING ALL CHANGES, SEE IF IT

```
0288   REF  13  LAST   63   06,2232  7 4704 1          MASK   BIT7        IS TIME TO ACT ON A TURN-ON SEQUENCE.
0289   REF   4  LAST  135   06,2233  10 000 0          CCS    A
0290   REF   1              06,2234  1 2367 0          TCF    C33TEST     NO - EXAMINE CHANNEL 33.

0291   REF  12  LAST   61   06,2235  3 4703 1          CAF    BIT8        SEE IF FIRST SAMPLE OR SECOND.
0292   REF   6  LAST  136   06,2236  7 1320 0          MASK   IMODES30
0293   REF   5  LAST  137   06,2237  10 000 0          CCS    A
0294   REF   1              06,2240  1 2244 0          TCF    PROCTNON    REACT AFTER SECOND SAMPLE.

0295   REF  13  LAST  137   06,2241  3 4703 1          CAF    BIT8        IF FIRST SAMPLE, SET BIT TO REACT NEXT
0296   REF   7  LAST  137   06,2242  27'320 0          ADS    IMODES30    TIME.
0297   REF   2  LAST  137   06,2243  1 2367 0          TCF    C33TEST

R0298                PROCESS IMU TURN-ON REQUESTS AFTER WAITING 1 SAMPLE FOR ALL SIGNALS TO ARRIVE.

0300   REF   1              06,2244  4 2757 1  PROCTNON CS     BITS7&8
0301   REF   8  LAST  137   06,2245  7 1320 0          MASK   IMODES30
0302   REF   9  LAST  137   06,2246  55'320 0          TS     IMODES30
0303   REF  16  LAST  135   06,2247  7 4675 0          MASK   BIT14       SEE IF TURN-ON REQUEST.
0304   REF   6  LAST  137   06,2250  10 000 0          CCS    A
0305   REF   1              06,2251  1 2342 1          TCF    OPONLY      OPERATE ON ONLY.

0306   REF  10  LAST  137   06,2252  4 1320 0          CS     IMODES30    IF TURN-ON REQUEST, WE SHOULD HAVE IMU
0307   REF  13  LAST  132   06,2253  7 4702 1          MASK   BIT9        OPERATE.
0308   REF   7  LAST  137   06,2254  10 000 0          CCS    A
0309                        06,2255  1 2260 0          TCF    +3

0310   REF   1              06,2256  0 5537 0          TC     ALARM       ALARM IF NOT.
0311                        06,2257  00213 1           OCT    213

0312   REF   1              06,2260  0 2717 1  +3      TC     CAGESUB

0313   REF   1              06,2261  3 2764 0          CAF    90SECS
0314   REF   1              06,2262  0 5140 1          TC     WAITLIST
0315   REF   1              E3,1474                    EBANK= CDUIND
0316   REF   1              06,2263  02270 0           2CADR  ENDTNON
0316   REF   1              06,2264  14063 1

0317   REF   3  LAST  137   06,2265  1 2367 0          TCF    C33TEST

0318   REF   2  LAST  137   06,2266  3 2764 0  RETNON  CAF    90SECS
0319   REF   1              06,2267  0 5161 1          TC     VARDELAY

0320   REF   8  LAST   62   06,2270  4 4711 0  ENDTNON CS     BIT2        RESET TURN-ON REQUEST FAIL BIT.
0321   REF  11  LAST  137   06,2271  7 1320 0          MASK   IMODES30
0322   REF  12  LAST  137   06,2272  57'320 1          XCH    IMODES30
0323   REF   9  LAST  137   06,2273  7 4711 0          MASK   BIT2        IF IT WAS OFF, SEND ISS DELAY COMPLETE.
0324                        06,2274  0 0006 1          EXTEND
0325   REF   1              06,2275  1 2310 0          BZF    ENDTNON2
```

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0326  REF  17  LAST  137  06,2276  3 4675 1          CAF     BIT14      IF IT WAS ON AND TURN-ON REQUEST NOW
0327  REF  13  LAST  137  06,2277  7 1320 C          MASK    IMODES30   PRESENT, RE-ENTER 90 SEC DELAY IN WL.
0328                       06,2300  0 0006 1          EXTEND
0329  REF   1             06,2301  1 2266 C          BZF     RETNCN

0330  REF  14  LAST   63  06,2302  4 0074 C          CS      STATE      IF IT IS NOT ON NOW, SEE IF A PROG WAS
0331  REF   1             06,2303  7 4703 C          MASK    IMUSEFLG   WAITING.
0332  REF   8  LAST  137  06,2304  10 000 C          CCS     A
0333  REF   1             06,2305  1 5213 C          TCF     TASKOVER
0334  REF   1             06,2306  0 4574 C          TC      POSTJUMP
0335  REF   1             06,2307   17441 C          CADR    IMUBAD     UNSUCCESSFUL TURN-ON.

0336  REF  10  LAST   6C  06,2310  3 4674 C  ENDTNON2 CAF     BIT15      SEND ISS DELAY COMPLETE.
0337                       06,2311  0 0006 1          EXTEND
0338  REF   1             06,2312  05 012 1          WOR     CHAN12     TURN OFF ISS DELAY COUNTER
0339  REF   2  LAST  132  06,2313  0 4633 C          TC      IBNKCALL   TURN OFF NO ATT LAMP.
0340  REF   1             06,2314   17C70 C          CADR    NOATTOFF

0341  REF   1             06,2315  0 5410 1  UNZ2     TC      ZEROICDU

0342  REF   1             06,2316  4 4722 C          CS      BITS4&5    REMOVE ZERO AND COARSE.
0343                       06,2317  0 0006 1          EXTEND
0344  REF   2  LAST  138  06,2320  03 012 1          WAND    CHAN12

0345  REF  11  LAST   6C  06,2321  3 4700 1          CAF     BIT11      WAIT 10 SECS FOR CTRS TO FIND GIMBALS
0346  REF   2  LAST  137  06,2322  0 5161 1          TC      VARDELAY

0347  REF   1             06,2323  4 2754 1  ISSUP    CS      OCT54      REMOVE CAGING, IMU FAIL INHIBIT, AND
0348  REF  14  LAST  138  06,2324  7 1320 C          MASK    IMODES30   ICDUFAIL INHIBIT FLAGS.
0349  REF  15  LAST  138  06,2325  55'320 C          TS      IMODES30

0350  REF  11  LAST   61  06,2326  4 4705 C          CS      BIT6       ENABLE DAP
0351  REF   4  LAST  131  06,2327  7 1321 1          MASK    IMODES33
0352  REF   5  LAST  13E  06,2330  55'321 1          TS      IMODES33

0353  REF   1             06,2331  0 2665 C          TC      SETISSW    ISS WARNING MIGHT HAVE BEEN INHIBITED.

0354  REF  11  LAST  138  06,2332  4 4674 1          CS      BIT15      REMOVE IMU CELAY COMPLETE DISCRETE.
0355                       06,2333  0 0006 1          EXTEND
0356  REF   3  LAST  138  06,2334  03 012 1          WAND    CHAN12

0357  REF   1             06,2335  3 4740 C          CAF     4SECS      DONT ENABLE PROG ALARM ON PIP FAIL FOR
0358  REF   2  LAST  137  06,2336  0 5140 1          TC      WAITLIST   ANOTHER 4 SECS.
0359  REF   2  LAST  137  E3,1474                     EBANK=  CDUIND
0360  REF   1             06,2337    03056 1        2CADR   PFAILOK
0360  REF   1             06,2340    16063 C

0364  REF   2  LAST  13E  06,2341  1 5213 C          TCF     TASKOVER

0367  REF  11  LAST   61  06,2342  3 4707 C  OPONLY   CAF     BIT4
```

```
0368                          06,2343  0 0006 1          EXTEND
0369  REF   4  LAST  138     06,2344  02 012 C          RAND    CHAN12      IF OPERATE ON ONLY AND WE ARE IN COARSE
0370  REF   9  LAST  138     06,2345  10 000 C          CCS     A           ALIGN, DONT ZERO THE CDUS BECAUSE WE
0371  REF   4  LAST  137     06,2346  1 2367 C          TCF     C33TEST     MIGHT BE IN GIMBAL LOCK. USE V41N20 TO
                                                                           RECOVER.
0372  REF   2  LAST  138     06,2347  3 4703 1          CAF     IMUSEFLG    OTHERWISE, ZERO THE COUNTERS
0373  REF  15  LAST  138     06,2350  7 0074 C          MASK    STATE       UNLESS SOMEONE IS USING THE IMU.
0374  REF  10  LAST  139     06,2351  10 000 C          CCS     A
0375  REF   5  LAST  139     06,2352  1 2367 C          TCF     C33TEST

0376  REF   1                 06,2353  0 2730 1          TC      CAGESUB2    SET TURNON FLAGS.

0377  REF   3  LAST  138     06,2354  0 4633 C ISSZERO  TC      IBNKCALL    TURN OFF NO ATT LAMP
0378  REF   2  LAST  138     06,2355   17070 C          CADR    NOATTOFF        IMU CAGE OFF ENTRY

0379  REF  10  LAST   61     06,2356  3 4706 1          CAF     BIT5        ISS CDU ZERO
0380                          06,2357  0 0006 1          EXTEND
0381  REF   5  LAST  139     06,2360  05 012 1          WOR     CHAN12

03811 REF   2  LAST  138     06,2361  0 5410 1          TC      ZEROICDU
0382  REF  12  LAST  138     06,2362  3 4705 1          CAF     BIT6        WAIT 300 MS FOR AGS TO RECEIVE SIGNAL.
0383  REF   3  LAST  138     06,2363  0 5140 1          TC      WAITLIST
0384  REF   1                   1331                    EBANK=  OPTMODES
0385  REF   1                 06,2364   02315 1          2CADR   UNZ2
0385  REF   1                 06,2365   14062 C

0386  REF   6  LAST  139     06,2366  1 2367 C          TCF     C33TEST
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L T4RUPT PROGRAM USER'S PAGE NO. 13 EO S3

P0387 PROGRAM NAME: C33TEST

R0388 FUNCTIONAL DESCRIPTION: THIS PROGRAM MONITORS THREE FLIP-FLOP INBITS OF CHANNEL 33 AND CALLS THE APPROPRIATE
R0390 SUBROUTINE TO PROCESS A CHANGE. IT IS ANALOGOUS TO IMUMON, WHICH MONITORS CHANNEL 30, EXCEPT THAT IT READS
R0392 CHANNEL 33 WITH A WAND INSTRUCTION BECAUSE A 'WRITE' PULSE IS REQUIRED TO RESET THE FLIP-FLOPS. THE BITS
R0394 PROCESSED AND THE SUBROUTINES CALLED ARE:

	BIT	FUNCTION	SUBROUTINE
R0397	13	PIPA FAIL	PIPFAIL
R0398	12	DOWNLINK TOO FAST	DNTMFAST
R0399	11	UPLINK TOO FAST	UPTMFAST

R0400 UPON ENTRY TO THE SUBROUTINE, THE NEW BIT STATE IS IN A.

R0401 CALLING SEQUENCE: EVERY 480 MILLISECONDS AFTER TNONTEST.

R0402 JOBS OR TASKS INITIATED: NONE.

R0403 SUBROUTINES CALLED: PIPFAIL, DNTMFAST AND UPTMFAST ON BIT CHANGES.

R0404 ERASABLE INITIALIZATION: C(IMODES33) = OCT 16000 ON A FRESH START OR RESTART, THEREFORE, THESE ALARMS WILL
R0406 REAPPEAR IF THE CONDITIONS PERSIST.

R0407 ALARMS: NONE.

R0408 EXIT: GLOCKMON.

R0409 OUTPUT: UPDATED BITS 13, 12 AND 11 OF IMODES33 WITH CHANGES PROCESSED.

```
0410  REF  6  LAST  138   06,2367  3 1321 0  C33TEST  CA     IMODES33   SEE IF RELEVANT CHAN 33 BITS HAVE
0411  REF  1              06,2370  7 4763 0            MASK   33RDMSK
0412  REF  2  LAST   38   06,2371  54 001 1            TS     L          CHANGED.
0413  REF  2  LAST  140   06,2372  3 4763 1            CAF    33RDMSK
0414                       06,2373  0 0006 1            EXTEND
0415  REF  1              06,2374  03 033 1            WAND   CHAN33     RESETS FLIP-FLOP INPUTS.
0416                       06,2375  0 0006 1            EXTEND
0417  REF  3  LAST  134   06,2376  06 001 0            RXOR   LCHAN
0418                       06,2377  0 0006 1            EXTEND
0419  REF  1              06,2400  1 2427 0            BZF    GLOCKMON   ON NO CHANGE.

0420  REF  8  LAST  135   06,2401  54 070 1            TS     RUPTREG1   SAVE BITS WHICH HAVE CHANGED.
0421  REF  7  LAST  140   06,2402  23'321 0            LXCH   IMODES33
0422                       06,2403  0 0006 1            EXTEND
0423  REF  4  LAST  140   06,2404  06 001 0            RXOR   LCHAN
0424  REF  8  LAST  140   06,2405  55'321 1            TS     IMODES33   UPDATED IMODES33.

0425  REF  3  LAST  130   06,2406  3 4714 1            CAF    ZERO
0426  REF  9  LAST  140   06,2407  56 070 0            XCH    RUPTREG1
0427                       06,2410  6 0000 1            DOUBLE
```

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0428  REF   1                 06,2411  1 2414 C            TCF     NXTIBT +1       SCAN FOR BIT CHANGES.

0429  REF   4  LAST  135      06,2412  6 4712 1   -1       AD      ONE
0430  REF  10  LAST  14C      06,2413  24 070 C   NXTIBT   INCR    RUPTREG1
0431                          06,2414  6 0000 1   +1       DOUBLE
0432  REF  11  LAST  139      06,2415  54 000 C            TS      A               (CODING IDENTICAL TO CHAN 30).
0433  REF   2  LAST  141      06,2416  1 2413 1            TCF     NXTIBT

0434  REF   3  LAST  139      06,2417  56 071 1            XCH     RUPTREG2
0435  REF  11  LAST  141      06,2420  50 070 C            INDEX   RUPTREG1        GET NEW VALUE OF BIT WHICH CHANGED.
0436  REF  11  LAST   6C      06,2421  3 4676 1            CAF     BIT13
0437  REF   9  LAST  14C      06,2422  7 1321 1            MASK    IMODES33
0438  REF  12  LAST  141      06,2423  50 070 C            INDEX   RUPTREG1
0439  REF   1                 06,2424  0 2745 C            TC      C33JMP

0440  REF   4  LAST  141      06,2425  10 071 C   NXTFL33  CCS     RUPTREG2        PROCESS POSSIBLE ADDITIONAL CHANGES.
0441  REF   3  LAST  141      06,2426  1 2412 C            TCF     NXTIBT -1
```

```
P0442   PROGRAM NAME:  GLOCKMON

R0443   FUNCTIONAL DESCRIPTION:  THIS PROGRAM MONITORS THE CDUZ COUNTER TO DETERMINE WHETHER THE ISS IS IN GIMBAL LOCK
R0445   AND TAKES ACTION IF IT IS.  THREE REGIONS OF MIDDLE GIMBAL ANGLE (MGA) ARE USED:

R0447           1) ABS(MGA) LESS THAN OR EQUAL TO 70 DEGREES - NORMAL MODE.
R0448           2) ABS(MGA) GREATER THAN 70 DEGREES AND LESS THAN OR EQUAL TO 85 DEGREES - GIMBAL LOCK LAMP TURNED ON.
R0450           3) ABS(MGA) GREATER THAN 85 DEGREES - ISS PUT IN COARSE ALIGN AND NO ATT LAMP TURNED ON.

R0452   CALLING SEQUENCE:  EVERY 480 MILLISECONDS AFTER C33TEST.

R0453   JOBS OR TASKS INITIATED:  NONE.

R0454   SUBROUTINES CALLED:  1) SETCOARS WHEN ABS(MGA) GREATER THAN 85 DEGREES AND ISS NOT IN COARSE ALIGN.
R0456                        2) LAMPTEST BEFORE TURNING OFF GIMBAL LOCK LAMP.

R0457   ERASABLE INITIALIZATION:
R0458           1) FRESH START OR RESTART WITH NO GROUPS ACTIVE:  C(CDUZ) = 0, IMODES30 BIT 6 = 0, IMODES33 BIT 1 = 0.
R0460           2) RESTART WITH GROUPS ACTIVE:  SAME AS FRESH START EXCEPT C(CDUZ) NOT CHANGED SO GIMBAL MONITOR
R0462                                           PROCEEDS AS BEFORE.

R0463   ALARMS:  1) MGA REGION (2) CAUSES GIMBAL LOCK LAMP TO BE LIT.
R0464           2) MGA REGION (3) CAUSES THE ISS TO BE PUT IN COARSE ALIGN AND THE NO ATT LAMP TO BE LIT IF EITHER NOT
R0466              SO ALREADY.

0467   REF   1                  06,2427  10 034 1  GLOCKMON CCS     CDUZ
0468   REF   1                  06,2430  1 2434 1            TCF     GLOCKCHK        SEE IF MAGNITUDE OF MGA IS GREATER THAN
0469   REF   1                  06,2431  1 2460 C            TCF     SETGLOCK        70 DEGREES.
0470   REF   2  LAST  142       06,2432  1 2434 1            TCF     GLOCKCHK
0471   REF   2  LAST  142       06,2433  1 2460 C            TCF     SETGLOCK

0472   REF   1                  06,2434  6 2505 C  GLOCKCHK AD      -70DEGS
0473                            06,2435  0 0006 1            EXTEND
0474   REF   3  LAST  142       06,2436  6 2457 C            BZMF    SETGLOCK -1     NO LOCK.

0475   REF   1                  06,2437  6 2506 C            AD      -15DEGS         SEE IF ABS(MGA) GREATER THAN 85 DEGS.
0476                            06,2440  0 0006 1            EXTEND
0477   REF   1                  06,2441  6 2455 1            BZMF    NOGIMRUN

0478   REF  12  LAST  138       06,2442  3 4707 C            CAF     BIT4            IF SO, SYSTEM SHOULD BE IN COARSE ALIGN
0479                            06,2443  0 0006 1            EXTEND                  TO PREVENT GIMBAL RUN-AWAY.
0480   REF   6  LAST  139       06,2444  02 012 C            RAND    CHAN12
0481   REF  12  LAST  141       06,2445  10 000 C            CCS     A
0482   REF   2  LAST  142       06,2446  1 2455 C            TCF     NOGIMRUN

0483   REF   4  LAST  139       06,2447  0 4633 C            TC      IBNKCALL        GO INTO COARSE ALIGN.
0484   REF   1                  06,2450   16746 C            CADR    SETCOARS

0485   REF   1                  06,2451  3 6211 C            CAF     SIX             ENABLE ISS ERROR COUNTERS IN 60 MS
0486   REF   4  LAST  139       06,2452  0 5140 1            TC      WAITLIST
```

```
0487   REF   3  LAST  138   E3,1474                        EBANK= CDUIND
0488   REF   1              06,2453   02742 1             2CADR  CA+ECE
0488   REF   1              06,2454   16063 0
0489   REF  13  LAST  139   06,2455  3 4705 1  NOGIMRUN  CAF    BIT6        TURN ON GIMBAL LOCK LAMP.
0490   REF   4  LAST  142   06,2456  1 2460 0            TCF    SETGLOCK

0491   REF   4  LAST  140   06,2457  3 4714 1  -1        CAF    ZERO
0492   REF   6  LAST  130   06,2460  6 1036 0  SETGLOCK  AD     DSPTAB +11D  SEE IF PRESENT STATE OF GIMBAL LOCK LAMP
0493   REF  14  LAST  143   06,2461  7 4705 0            MASK   BIT6         AGREES WITH DESIRED STATE BY HALF ADDING
0494                        06,2462  0 0006 1            EXTEND              THE TWO.
0495   REF   1              06,2463  1 5222 1            BZF    GLOCKOK      OK AS IS.

0496   REF   7  LAST  143   06,2464  7 1036 1            MASK   DSPTAB +11D  IF OFF, DONT TURN ON IF IMU BEING CAGED.
0497   REF  13  LAST  142   06,2465  10 000 0            CCS    A
0498   REF   1              06,2466  1 2502 0            TCF    GLAMPTST     TURN OFF UNLESS LAMP TEST IN PROGRESS.

0499   REF  15  LAST  143   06,2467  3 4705 1            CAF    BIT6
0500   REF  16  LAST  138   06,2470  7 1320 0            MASK   IMODES30
0501   REF  14  LAST  143   06,2471  10 000 0            CCS    A
0502   REF   2  LAST  143   06,2472  1 5222 1            TCF    GLOCKOK

0503   REF   8  LAST  143   06,2473  4 1036 1  GLINVERT  CS     DSPTAB +11D  INVERT GIMBAL LOCK LAMP.
0504   REF  16  LAST  143   06,2474  7 4705 0            MASK   BIT6
0505   REF  12  LAST  138   06,2475  6 4674 0            AD     BIT15        TO INDICATE CHANGE IN DSPTAB +11D.
0506   REF   9  LAST  143   06,2476  57'036 0            XCH    DSPTAB +11D
0507   REF   1              06,2477  7 2164 1            MASK   OCT37737
0508   REF  10  LAST  143   06,2500  27'036 1            ADS    DSPTAB +11D
0509   REF   3  LAST  143   06,2501  1 5222 1            TCF    GLOCKOK

0510   REF   1              06,2502  0 2750 1  GLAMPTST  TC     LAMPTEST     TURN OFF UNLESS LAMP TEST IN PROGRESS.
0511   REF   4  LAST  143   06,2503  1 5222 1            TCF    GLOCKOK
0512   REF   1              06,2504  1 2473 1            TCF    GLINVERT

0513                        06,2505   63434 1  -70DEGS   DEC    -.38888      -70 DEGREES SCALED IN HALF-REVOLUTIONS.
0514                        06,2506   75252 0  -15DEGS   DEC    -.08333
```

R0515 PROGRAM NAME: TLIN.

R0516 FUNCTIONAL DESCRIPTION: THIS PROGRAM MAINTAINS THE TEMP LAMP (BIT 4 OF CHANNEL 11) ON THE DSKY TO AGREE WITH
R0518 THE TEMP SIGNAL FROM THE ISS (BIT 15 OF CHANNEL 30). HOWEVER, THE LIGHT WILL NOT BE TURNED OFF IF A LAMP TEST
R0520 IS IN PROGRESS.

R0521 CALLING SEQUENCE: CALLED BY IMUMON ON A CHANGE OF BIT 15 OF CHANNEL 30.

R0522 JOBS OR TASKS INITIATED: NONE.

R0523 SUBROUTINES CALLED: LAMPTEST.

R0524 ERASABLE INITIALIZATION: FRESH START AND RESTART TURN THE TEMP LAMP OFF.

R0526 ALARMS: TEMP LAMP TURNED ON WHEN IMU TEMP GOES OUT OF LIMITS.

R0527 EXIT: NXTIFAIL.

R0528 OUTPUT: SERVICE OF TEMP LAMP. IN A, EXCEPT FOR TLIM.

```
0530   REF   1              06,2507  7 4672 1  TLIM    MASK    POSMAX      REMOVE BIT FROM WORD OF CHANGES AND SET
0531   REF   5  LAST  141   06,2510  54 071 C          TS      RUPTREG2    DSKY TEMP LAMP ACCORDINGLY.

0532   REF  17  LAST  143   06,2511  11'320 C          CCS     IMODES30
0533   REF   1              06,2512  1 2520 C          TCF     TEMPCK
0534   REF   2  LAST  144   06,2513  1 2520 C          TCF     TEMPCK

0535   REF  13  LAST  142   06,2514  3 4707 C          CAF     BIT4        TURN ON LAMP.
0536                        06,2515  0 0006 1          EXTEND
0537   REF   1              06,2516  05 011 1          WOR     DSALMOUT
0538   REF   1              06,2517  1 2227 C          TCF     NXTIFAIL

0539   REF   2  LAST  143   06,2520  0 2750 1  TEMPOK  TC      LAMPTEST    IF TEMP NOW OK, DONT TURN OFF LAMP IF
0540   REF   2  LAST  144   06,2521  1 2227 C          TCF     NXTIFAIL    LAMP TEST IN PROGRESS.

0541   REF  14  LAST  144   06,2522  4 4707 1          CS      BIT4
0542                        06,2523  0 0006 1          EXTEND
0543   REF   2  LAST  144   06,2524  03 011 1          WAND    DSALMOUT    TURN OFF TEMP CAUTION
0544   REF   3  LAST  144   06,2525  1 2227 C          TCF     NXTIFAIL
```

```
R0545   PROGRAM NAME:  ITURNON.

R0546   FUNCTIONAL DESCRIPTION:  THIS PROGRAM IS CALLED BY IMUMON WHEN A CHANGE OF BIT 14 OF CHANNEL 30 (ISS TURN-ON
R0548   REQUEST) IS DETECTED.  UPON ENTRY, ITURNON CHECKS IF A TURN-ON DELAY SEQUENCE HAS FAILED, AND IF SO, IT EXITS.
R0550   IF NOT, IT CHECKS WHETHER THE TURN-ON REQUEST CHANGE IS TO ON OR OFF.  IF ON, IT SETS BIT 7 OF IMODES30 TO 1 SO
R0552   THAT INCNTEST WILL INITIATE THE ISS INITIALIZATION SEQUENCE.  IF OFF, THE TURN-ON DELAY SIGNAL, CHANNEL 12 BIT
R0554   15, IS CHECKED AND IF IT IS ON, ITURNON EXITS.  IF THE DELAY SIGNAL IS OFF, PROGRAM ALARM 00207 IS ISSUED, BIT 2
R0556   OF IMODES30 IS SET TO 1 AND THE PROGRAM EXITS.
R0557           THE SETTING OF BIT 2 OF IMODES30 (ISS DELAY SEQUENCE FAIL) INHIBITS THIS ROUTINE AND IMUOP FROM
R0559   PROCESSING ANY CHANGES.  THIS BIT WILL BE RESET BY THE ENDTNON ROUTINE WHEN THE CURRENT 90 SECOND DELAY PERIOD
R0561   ENDS.

R0562   CALLING SEQUENCE:  FROM IMUMON WHEN ISS TURN-ON REQUEST CHANGES STATE.

R0563   JOBS OR TASKS INITIATED:  NONE.

R0564   SUBROUTINES CALLED:  ALARM, IF THE ISS TURN-ON REQUEST IS NOT PRESENT FOR 90 SECONDS.

R0566   ERASABLE INITIALIZATION:  FRESH START AND RESTART SET BIT 15 OF CHANNEL 12 AND BITS 2 AND 7 OF IMODES30 TO 0,
R0568   AND BIT 14 OF IMODES30 TO 1.

R0569   ALARMS:  PROGRAM ALARM 00207 IS ISSUED IF THE ISS TURN-ON REQUEST SIGNAL IS NOT PRESENT FOR 90 SECONDS.

R0571   EXIT:  NXTIFAIL.

R0572   OUTPUT:  BIT 7 OF IMODES30 TO START ISS INITIALIZATION, OR BIT 2 OF IMODES30 AND PROGRAM ALARM 00207 TO INDICATE
R0574   A FAILED TURN-ON SEQUENCE.

0575    REF  10  LAST  137   06,2526  3 4711 1  ITURNON  CAF   BIT2       IF DELAY REQUEST HAS GONE OFF
0576    REF  18  LAST  144   06,2527  7 1320 0            MASK  IMODES30   PREMATURELY, DO NOT PROCESS ANY CHANGES
0577    REF  15  LAST  143   06,2530  10 000 0            CCS   A          UNTIL THE CURRENT 90 SEC WAIT EXPIRES.
0578    REF   4  LAST  144   06,2531  1 2227 0            TCF   NXTIFAIL

0579    REF  18  LAST  138   06,2532  3 4675 1            CAF   BIT14      SEE IF JUST ON OR OFF.
0580    REF  19  LAST  145   06,2533  7 1320 0            MASK  IMODES30
0581                         06,2534  0 0006 1            EXTEND
0582    REF   1              06,2535  1 2551 0            BZF   ITURNON2   IF JUST ON.

0583    REF  13  LAST  143   06,2536  3 4674 0            CAF   BIT15
0584                         06,2537  0 0006 1            EXTEND           SEE IF DELAY PRESENT DISCRETE HAS BEEN
0585    REF   7  LAST  142   06,2540  02 012 0            RAND  CHAN12     SENT. IF SO, ACTION COMPLETE.
0586                         06,2541  0 0006 1            EXTEND
0587                         06,2542  1 2544 1            BZF   +2
0588    REF   5  LAST  145   06,2543  1 2227 0            TCF   NXTIFAIL

0589    REF  11  LAST  145   06,2544  3 4711 1            CAF   BIT2       IF NOT, SET BIT TO INDICATE REQUEST NOT
0590    REF  20  LAST  145   06,2545  27'320 0            ADS   IMODES30   PRESENT FOR FULL DURATION.
0591    REF   2  LAST  137   06,2546  0 5537 0            TC    ALARM
0592                         06,2547   00207 1            OCT   207
0593    REF   6  LAST  145   06,2550  1 2227 0            TCF   NXTIFAIL
```

```
0594   REF  21  LAST  145   06,2551  4 1320 C  ITURNON2 CS     IMODES30      SET BIT7 TO INDICATE WAIT OF 1 SAMPLE
0595   REF  14  LAST  137   06,2552  7 4704 1            MASK   BIT7
0596   REF  22  LAST  146   06,2553  27'320 C            ADS    IMODES30
0597   REF   7  LAST  145   06,2554  1 2227 C            TCF    NXTIFAIL
```

```
R0598   PROGRAM NAME:  IMUCAGE.

R0599   FUNCTIONAL DESCRIPTION:  THIS PROGRAM PROCESSES CHANGES OF THE IMUCAGE INBIT, CHANNEL 30 BIT 11.  IF THE BIT
R0601   CHANGES TO 0 (CAGE BUTTON PRESSED), THE ISS IS CAGED (ICDU ZERO + COARSE ALIGN + NO ATT LAMP) UNTIL THE
R0603   ASTRONAUT SELECTS ANOTHER PROGRAM TO ALIGN THE ISS.  ANY PULSE TRAINS TO THE ICDU'S AND GYRO'S ARE TERMINATED,
R0605   THE ASSOCIATED OUTCOUNTERS ARE ZEROED AND THE GYRO'S ARE DE-SELECTED.  NO ACTION OCCURS WHEN THE BUTTON IS
R0607   RELEASED (INBIT CHANGES TO 1).

R0608   CALLING SEQUENCE:  BY IMUMON WHEN IMU CAGE BIT CHANGES.

R0609   JOBS OR TASKS INITIATED:  NONE.

R0610   SUBROUTINES CALLED:  CAGESUB.

R0611   ERASABLE INITIALIZATION:  FRESH START AND RESTART SET BIT 11 OF IMODES30 TO 1.

R0613   ALARMS:  NONE.

R0614   EXIT:  NXTIFAIL.

R0615   OUTPUT:  ISS CAGED, COUNTERS ZEROED, PULSE TRAINS TERMINATED AND NO ATT LAMP LIT.

 0617   REF  16  LAST  145   06,2555  10 000 C  IMUCAGE  CCS     A              NO ACTION IF GOING OFF.
 0618   REF   1              06,2556  1 2354 C           TCF     ISSZERO
 0619   REF   1              06,2557  4 2762 1           CS      OCT77000       TERMINATE ICDU,OPTICS,GYRO PULSE TRAINS
 0620                        06,2560  0 0006 1           EXTEND
 0621   REF   1              06,2561  03 014 1           WAND    CHAN14

 0622   REF   1              06,2562  4 2756 C           CS      OCT272         KNOCK DOWN TVC ENABLE, IMU ERROR COUNTER
 0623                        06,2563  0 0006 1           EXTEND                     ENABLE, ZERO ICDU, COARSE ALIGN
 0624   REF   8  LAST  145   06,2564  03 012 1           WAND    CHAN12             ENABLE, OPTICS ERR CNTR ENABLE

 0625   REF  12  LAST  141   06,2565  4 4676 C           CS      BIT13          TURN OFF ENGINE
 0626                        06,2566  0 0006 1           EXTEND
 0627   REF   3  LAST  144   06,2567  03 011 1           WAND    DSALMOUT

 0628   REF   1              06,2570  0 2725 C           TC      CAGESUB1

 0629   REF   5  LAST  142   06,2571  0 4633 C           TC      IBNKCALL       KNOCK DOWN TRACK, REFSMMAT, DRIFT FLAGS
 0630   REF   1              06,2572    16777 1          CADR    RNDREFDR

 0631   REF   5  LAST  143   06,2573  4 4714 C           CS      ZERO           ZERO COMMAND OUT-COUNTERS
 0632   REF   1              06,2574  54 050 C           TS      CDUXCMD
 0633   REF   1              06,2575  54 051 1           TS      CDUYCMD
 0634   REF   1              06,2576  54 052 1           TS      CDUZCMD
 0635   REF   1              06,2577  54 047 C           TS      GYROCMD

 0636   REF   1              06,2600  4 2761 1           CS      OCT740         HAVING WAITED AT LEAST 27 MCT FROM
 0637                        06,2601  0 0006 1           EXTEND                 GYRO PULSE TRAIN TERMINATION, WE CAN
 0638   REF   2  LAST  147   06,2602  03 014 1           WAND    CHAN14         DE-SELECT THE GYROS.
```

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0639 REF 8 LAST 146 06,2603 1 2227 C TCF NXTIFAIL

R0640 PROGRAM NAME: IMUOP.

R0641 FUNCTIONAL DESCRIPTION: THIS PROGRAM PROCESSES CHANGES IN THE ISS OPERATE DISCRETE, BIT 9 OF CHANNEL 30.
R0643 IF THE INBIT CHANGES TO 0, INDICATING ISS ON, IMUOP GENERALLY SETS BIT 7 OF IMODES30 TO 1 TO REQUEST ISS
R0645 INITIALIZATION VIA TNONTEST. AN EXCEPTION IS DURING A FAILED ISS DELAY DURING WHICH BIT 2 OF IMODES30 IS SET
R0647 TO 1 AND NO FURTHER INITIALIZATION IS REQUIRED. WHEN THE INBIT CHANGES TO 1, INDICATING ISS OFF, IMUSEFLG IS
R0649 TESTED TO SEE IF ANY PROGRAM WAS USING THE ISS. IF SO, PROGRAM ALARM 00214 IS ISSUED.

R0651 CALLING SEQUENCE: BY IMUMON WHEN BIT 9 OF CHANNEL 30 CHANGES.

R0652 JOBS OR TASKS INITIATED: NONE.

R0653 SUBROUTINES CALLED: ALARM, IF ISS IS TURNED OFF WHILE IN USE.

R0654 ERASABLE INITIALIZATION: ON FRESH START AND RESTART, BIT 9 OF IMODES30 IS SET TO 1 EXCEPT WHEN THE GIMBAL LOCK
R0656 LAMP IS ON, IN WHICH CASE IT IS SET TO 0. THIS PREVENTS ICDU ZERO BY TNONTEST WITH THE ISS IN GIMBAL LOCK.

R0658 ALARMS: PROGRAM ALARM 00214 IF THE ISS IS TURNED OFF WHILE IN USE.

R0659 EXIT: NXTIFAIL.

R0660 OUTPUT: ISS INITIALIZATION REQUEST (IMODES30 BIT 7) OR PROGRAM ALARM 00214.

```
0662                          06,2604  0 0006 1  IMUOP    EXTEND                    IF OPERATE JUST ON, WAIT 1 SAMPLE.
0663   REF    1               06,2605  1 2625 0           BZF     IMUOP2

0664   REF   10  LAST  141    06,2606  4 1321 1           CS      IMODES33          DISABLE DAP
0665   REF   17  LAST  143    06,2607  7 4705 0           MASK    BIT6
0666   REF   11  LAST  149    06,2610  27*321 1           ADS     IMODES33

0667   REF    6  LAST  147    06,2611  0 4633 0           TC      IBNKCALL          KNOCK DOWN TRACK, REFSMMAT, DRIFT FLAGS
0668   REF    2  LAST  147    06,2612   16777 1           CADR    RNDREFDR

0669   REF    2  LAST  137    06,2613  4 2757 1           CS      BITS7&8           KNOCK DOWN RENDEVOUS, IMUUSE FLAGS
0670   REF   16  LAST  139    06,2614  7 0074 0           MASK    STATE
0671   REF   17  LAST  149    06,2615  56 074 1           XCH     STATE             IF GOING OFF, ALARM IF PROG USING IMU
0672                          06,2616  4 0000 0           COM
0673   REF    3  LAST  139    06,2617  7 4703 0           MASK    IMUSEFLG
0674   REF   17  LAST  147    06,2620  10 000 0           CCS     A
0675   REF    9  LAST  148    06,2621  1 2227 0           TCF     NXTIFAIL

0676   REF    3  LAST  145    06,2622  0 5537 0           TC      ALARM
0677                          06,2623   00214 0           OCT     214
0678   REF   10  LAST  149    06,2624  1 2227 0           TCF     NXTIFAIL

0679   REF   12  LAST  145    06,2625  3 4711 1  IMUOP2   CAF     BIT2              SEE IF FAILED ISS TURN-ON SEQ IN PROG.
0680   REF   23  LAST  146    06,2626  7 1320 0           MASK    IMODES30
0681   REF   18  LAST  149    06,2627  10 000 0           CCS     A
0682   REF   11  LAST  149    06,2630  1 2227 0           TCF     NXTIFAIL          IF SO, DONT PROCESS UNTIL PRESENT 90
0683   REF    2  LAST  145    06,2631  1 2551 0           TCF     ITURNON2          SECONDS EXPIRES.
```

```
P0684   PROGRAM NAME:  PIPFAIL

R0685   FUNCTIONAL DESCRIPTION:  THIS PROGRAM PROCESSES CHANGES OF BIT 13 OF CHANNEL 33, PIPA FAIL.  IT SETS BIT 10 OF
R0687   IMODES30 TO AGREE.  IT CALLS SETISSW IN CASE A PIPA FAIL NECESSITATES AN ISS WARNING.  IF NOT,I.E., IMODES30
R0689   BIT 1 = 1, AND A PIPA FAIL IS PRESENT AND THE ISS IS NOT BEING INITIALIZED, PROGRAM ALARM 00212 IS ISSUED.

R0691   CALLING SEQUENCE:  BY C33TEST ON CHANGES OF CHANNEL 33 BIT 13.

R0692   JOBS OR TASKS INITIATED:  NONE.

R0693   SUBROUTINES CALLED:  1) SETISSW, AND 2) ALARM (SEE FUNCTIONAL DESCRIPTION).

R0695   ERASABLE INITIALIZATION:  SEE INUMON FOR INITIALIZATION OF IMODES30.  THE RELAVANT BITS ARE 5, 7, 8, 9, AND 10.

R0697   ALARMS:  PROGRAM ALARM 00212 IF PIPA FAIL IS PRESENT BUT NEITHER ISS WARNING IS TO BE ISSUED NOR THE ISS IS
R0699   BEING INITIALIZED.

R0700   EXIT:  NXTFL33.

R0701   OUTPUT:  PROGRAM ALARM 00212 AND ISS WARNING MAINTENANCE.

 0702   REF  19  LAST  149   06,2632  10 000 C  PIPFAIL  CCS    A          SET BIT10 IN IMODES30 SO ALL ISS WARNING
 0703   REF  12  LAST   61   06,2633  3 4701 C            CAF    BIT10      INFO IS IN ONE REGISTER.
 0704   REF  24  LAST  149   06,2634  57'320 1            XCH    IMODES30
 0705   REF   1              06,2635  7 2763 C            MASK   -BIT10
 0706   REF  25  LAST  15C   06,2636  27'320 C            ADS    IMODES30

 0707   REF   2  LAST  13E   06,2637  0 2665 C            TC     SETISSW

 0708   REF  26  LAST  15C   06,2640  4 1320 C            CS     IMODES30   IF PIP FAIL DOESNT LIGHT ISS WARNING, DO
 0709   REF  11  LAST   62   06,2641  7 4712 C            MASK   BIT1       A PROGRAM ALARM IF IMU OPERATING BUT NOT
 0710   REF  20  LAST  15C   06,2642  10 000 C            CCS    A          CAGED OR BEING TURNED ON.
 0711   REF   1              06,2643  1 2425 1            TCF    NXTFL33

 0712   REF  27  LAST  15C   06,2644  3 1320 1            CA     IMODES30
 0713   REF   1              06,2645  7 2760 C            MASK   OCT1720
 0714   REF  21  LAST  15C   06,2646  10 000 C            CCS    A
 0715   REF   2  LAST  15C   06,2647  1 2425 1            TCF    NXTFL33    ABOVE CONDITION NOT MET.

 0716   REF   4  LAST  149   06,2650  0 5537 C            TC     ALARM
 0717                        06,2651   00212 C            OCT    212
 0718   REF   3  LAST  15C   06,2652  1 2425 1            TCF    NXTFL33
```

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P0719 PROGRAM NAMES: DNTMFAST, UPTMFAST

R0720 FUNCTIONAL DESCRIPTION: THESE PROGRAMS PROCESS CHANGES OF BITS 12 AND 11 OF CHANNEL 33. IF A BIT CHANGES TO A
R0722 0, A PROGRAM ALARM IS ISSUED. THE ALARMS ARE:

	BIT	ALARM	CAUSE
R0723			
R0724	---	-----	-----
R0725	12	01105	DOWNLINK TOO FAST
R0726	11	01106	UPLINK TOO FAST

R0727 CALLING SEQUENCE: BY C33TEST ON A BIT CHANGE.

R0728 SUBROUTINES CALLED: ALARM, IF A BIT CHANGES TO A 0.

R0729 ERASABLE INITIALIZATION: FRESH START OR RESTART, BITS 12 AND 11 OF IMODES33 ARE SET TO 1.

R0731 ALARMS: SEE FUNCTIONAL DESCRIPTION.

R0732 EXIT: NXTFL33.

R0733 OUTPUT: PROGRAM ALARM ON A BIT CHANGE TO 0.

```
 0734   REF  22  LAST  15C   06,2653  10 000 C  DNTMFAST CCS    A          DO PROG ALARM IF TM TOO FAST.
 0735   REF   4  LAST  15C   06,2654  1 2425 1            TCF    NXTFL33

 0736   REF   5  LAST  15C   06,2655  0 5537 C            TC     ALARM
 0737                        06,2656   01105 1            OCT    1105
 0738   REF   5  LAST  151   06,2657  1 2425 1            TCF    NXTFL33

 0739   REF  23  LAST  151   06,2660  10 000 C  UPTMFAST CCS    A          SAME AS DNLINK TOO FAST WITH DIFFERENT
 0740   REF   6  LAST  151   06,2661  1 2425 1            TCF    NXTFL33    ALARM CODE.

 0741   REF   6  LAST  151   06,2662  0 5537 C            TC     ALARM
 0742                        06,2663   01106 1            OCT    1106
 0743   REF   7  LAST  151   06,2664  1 2425 1            TCF    NXTFL33
```

R0744 PROGRAM NAME: SETISSW

R0745 FUNCTIONAL DESCRIPTION: THIS PROGRAM TURNS THE ISS WARNING LAMP ON AND OFF (CHANNEL 11 BIT 1 = 1 FOR ON,
R0747 0 FOR OFF) DEPENDING ON THE STATUS OF IMODES30 BITS 13 (IMU FAIL) AND 4 (INHIBIT IMU FAIL), 12 (ICDU FAIL) AND
R0749 3 (INHIBIT ICDU FAIL), AND 10 (PIPA FAIL) AND 1 (INHIBIT PIPA FAIL). THE LAMP IS LEFT ON IF A LAMP TEST IS IN
R0751 PROGRESS.

R0752 CALLING SEQUENCE: CALLED BY IMUMON ON CHANGES TO IMU FAIL AND ICDU FAIL. CALLED BY IFAILOK AND PFAILOK UPON
R0754 REMOVAL OF THE FAIL INHIBITS. CALLED BY PIPFAIL WHEN THE PIPA FAIL DISCRETE CHANGES. IT IS CALLED BY PIPUSE
R0756 SINCE THE PIPA FAIL PROGRAM ALARM MAY NECESSITATE AN ISS WARNING, AND LIKEWISE BY PIPFREE WHEN THE ALARM DEPARTS
R0758 AND IT IS CALLED BY IMUZERO3 AND ISSUP AFTER THE FAIL INHIBITS HAVE BEEN REMOVED.

R0760 JOBS OR TASKS INITIATED: NONE.

R0761 SUBROUTINES CALLED: NONE.

R0762 ERASABLE INITIALIZATION:

R0763 1) IMODES30 - SEE IMUMON.
R0764 2) IMODES33 BIT 1 = 0 (LAMP TEST NOT IN PROGRESS).

R0765 ALARMS: ISS WARNING.

R0766 EXIT: VIA Q.

R0767 OUTPUT: ISS WARNING LAMP SET PROPERLY.

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0768  REF   1                 06,2665  3 4720 C  SETISSW  CAF     OCT15       SET ISS WARNING USING THE FAIL BITS IN
0769  REF  28  LAST  150      06,2666  7 1320 C            MASK    IMODES30    BITS 13, 12, AND 10 OF IMODES30 AND THE
0770                          06,2667  0 0006 1            EXTEND              FAILURE INHIBIT BITS IN POSITIONS
0771  REF  13  LAST  150      06,2670  7 4701 1            MP      BIT10       4, 3, AND 1.
0772  REF  29  LAST  152      06,2671  3 1320 1            CA      IMODES30
0773                          06,2672  0 0006 1            EXTEND
0774  REF   5  LAST  140      06,2673  04 001 1            ROR     LCHAN       0 INDICATES FAILURE.
0775                          06,2674  4 0000 C            COM
0776  REF   1                 06,2675  7 4762 1            MASK    OCT15000
0777  REF  24  LAST  151      06,2676  10 000 C            CCS     A
0778  REF   1                 06,2677  1 2710 1            TCF     ISSWON      FAILURE.

0779  REF  12  LAST  150      06,2700  3 4712 1  ISSWOFF   CAF     BIT1        DONT TURN OFF ISS WARNING IF LAMP TEST
0780  REF  12  LAST  149      06,2701  7 1321 1            MASK    IMODES33    IN PROGRESS.
0781  REF  25  LAST  152      06,2702  10 000 C            CCS     A
0782  REF   3  LAST  130      06,2703  0 0002 C            TC      Q

0783  REF  13  LAST  152      06,2704  4 4712 C            CS      BIT1
0784                          06,2705  0 0006 1            EXTEND
0785  REF   4  LAST  147      06,2706  03 011 1            WAND    DSALMOUT    TURN OFF ISS WARNING
0786  REF   4  LAST  152      06,2707  0 0002 C            TC      Q

0787                          06,2710  0 0006 1  ISSWON    EXTEND
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07871  REF   1                  06,2711  22 066 1            QXCH   ITEMP6
07872  REF   1                  06,2712  0 5653 1            TC     VARALARM      TELL EVERYONE WHAT CAUSED THE ISSWARNING
07873  REF  14  LAST  152       06,2713  3 4712 1            CAF    BIT1
0788                             06,2714  0 0006 1            EXTEND
0789   REF   5  LAST  152       06,2715  05 011 1            WOR    DSALMOUT      TURN ON ISS WARNING
0790   REF   2  LAST  153       06,2716  0 0066 1            TC     ITEMP6
0791   REF   1                  06,2717  4 7703 C  CAGESUB   CS     BIT15+6       SET OUTBITS + INTERNAL FLAGS FOR
0792                             06,2720  0 0006 1            EXTEND                SYSTEM TURN-ON OR CAGE. DISABLE THE
0793   REF   9  LAST  147       06,2721  03 012 1            WAND   CHAN12         ERROR COUNTER AND REMOVE IMU DELAY COMP.
0794   REF   2  LAST  138       06,2722  3 4722 1            CAF    BITS4&5       SEND ZERO AND COARSE.
0795                             06,2723  0 0006 1            EXTEND
0796   REF  10  LAST  153       06,2724  05 012 1            WOR    CHAN12

0797   REF  11  LAST  143       06,2725  4 1036 1  CAGESUB1  CS     DSPTAB +11D   TURN ON NO ATT LAMP
0798   REF   1                  06,2726  7 2753 C            MASK   OC40010
0799   REF  12  LAST  153       06,2727  27'036 1            ADS    DSPTAB +11D

0800   REF  30  LAST  152       06,2730  4 1320 C  CAGESUB2  CS     IMODES30      SET FLAGS TO INDICATE CAGING OR TURN-ON
0801   REF   1                  06,2731  7 2755 C            MASK   OCT75               AND INHIBIT ALL ISS WARNING INFO
0802   REF  31  LAST  153       06,2732  27'320 C            ADS    IMODES30

0803   REF  13  LAST  152       06,2733  4 1321 1            CS     IMODES33      DISABLE DAP AUTO AND HOLD MODES
0804   REF  18  LAST  149       06,2734  7 4705 0            MASK   BIT6
0805   REF  14  LAST  153       06,2735  27'321 1            ADS    IMODES33

0806   REF   5  LAST  152       06,2736  0 0002 0            TC     Q

0807   REF   3  LAST  15C       06,2665                      IMUFAIL  EQUALS SETISSW
0808   REF   4  LAST  153       06,2665                      ICDUFAIL EQUALS SETISSW
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PQ809                   JUMP TABLES AND CONSTANTS.

 0810   REF   1                  06,2737  1 2526 C  IFAILJMP TCF     ITURNON         CHANNEL 30 DISPATCH.
 0811   REF   1                  06,2740  1 2665 1            TCF     IMUFAIL
 0812   REF   1                  06,2741  1 2665 1            TCF     ICDUFAIL
 0813   REF   1                  06,2742  1 2555 1            TCF     IMUCAGE
 0814                            06,2743    76400 1  30RDMSK  OCT     76400           (BIT 10 NOT SAMPLED HERE).
 0815   REF   1                  06,2744  1 2604 C            TCF     IMUOP

 0816   REF   1                  06,2745  1 2632 0  C33JMP   TCF     PIPFAIL         CHANNEL 33 DISPATCH.
 0817   REF   1                  06,2746  1 2653 1            TCF     DNTMFAST
 0818   REF   1                  06,2747  1 2660 1            TCF     UPTMFAST

RQ819                   SUBROUTINE TO SKIP IF LAMP TEST NOT IN PROGRESS.
 0820   REF  15 LAST  153        06,2750  4 1321 1  LAMPTEST CS      IMODES33        BIT 1 OF IMODES33 = 1 IF LAMP TEST IN
 0821   REF  15 LAST  153        06,2751  7 4712 C            MASK    BIT1            PROGRESS.
 0822   REF   1                  06,2752  1 3065 C            TCF     ZOPFIN3

 0823   REF   1                     4763                    33RDMSK  EQUALS  PRIO16
 0824                            06,2753    40010 1  OC40010  OCT     40010
 0826                            06,2754    00054 C  OCT54    OCT     54
 0827                            06,2755    00075 C  OCT75    OCT     75
 0828                            06,2756    00272 0  OCT272   OCT     00272
 0829                            06,2757    00300 1  BITS768  OCT     300
 0830                            06,2760    01720 C  OCT1720  OCT     1720
 0831                            06,2761    00740 1  OCT740   OCT     00740
 0832   REF   1                     4762                    OCT15000 EQUALS  PRIO15
 0833                            06,2762    77000 1  OCT77000 OCT     77000
 0834                            06,2763    76777 1  -BIT10   OCT     -1000

 0835                            06,2764    21450 C  90SECS   DEC     9000
 0836   REF   1                     5660                    120MS    =       OCT14          (DEC 12)
 0837   REF   8 LAST  133           5222                    GLOCKOK  EQUALS  RESUME
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P0838   OPTICS MONITORING AND ZERO ROUTINES
 0839   REF   2  LAST  139   06,2765  3 1331 1  OPTMON   CA      OPTMODES     MONITOR OPTICS INBITS IN CHAN 30 AND 33
 0840                        06,2766  0 0006 1           EXTEND
 0841   REF   2  LAST  134   06,2767  06 030 1           RXOR    CHAN30       LOOK FOR OCCU FAIL BIT CHANGE
 0842   REF  15  LAST  146   06,2770  7 4704 1           MASK    BIT7
 0843   REF  13  LAST  141   06,2771  54 070 1           TS      RUPTREG1     STORE CHANGE BIT
 0844   REF  26  LAST  152   06,2772  10 000 0           CCS     A
 0845   REF   1              06,2773  0 3224 0           TC      OCDUFTST     PROCESS OCDUFAIL BIT CHANGE

 0846   REF   1              06,2774  11'303 1  33OPTMON CCS     OPTIND       BYPASS IF TVC TAKEOVER
 0847                        06,2775  1 3001 1           TCF     +4
 0848                        06,2776  1 3001 1           TCF     +3
 0849                        06,2777  1 3001 1           TCF     +2
 0850   REF   9  LAST  154   06,3000  1 5222 1           TCF     RESUME

 0851   REF   3  LAST  155   06,3001  3 1331 1           CA      OPTMODES     LOOK FOR OPTICS MODE SWITCH CHANGE
 0852                        06,3002  0 0006 1           EXTEND
 0853   REF   2  LAST  140   06,3003  06 033 1           RXOR    CHAN33
 0854   REF   1              06,3004  7 4722 0           MASK    OCTHIRTY
 0855   REF  14  LAST  155   06,3005  26 070 1           ADS     RUPTREG1     STORE INBIT CHANGES
 0856   REF   4  LAST  155   06,3006  23'331 1           LXCH    OPTMODES
 0857                        06,3007  0 0006 1           EXTEND
 0858   REF   6  LAST  152   06,3010  06 001 0           RXOR    LCHAN
 0859   REF   5  LAST  155   06,3011  55'331 0           TS      OPTMODES     UPDATE OPTMODES TO SHOW BIT  CHANGES
 0860                        06,3012  4 0000 0           COM                  SAMPLE CURRENT SWITCH SETTING
 0861   REF   2  LAST  155   06,3013  7 4722 0           MASK    OCTHIRTY
 0862                        06,3014  0 0006 1           EXTEND
 0863   REF   1              06,3015  1 3022 0           BZF     SETSAMP      MANUAL-SET ZERO IN SWSAMPLE

 0864   REF  11  LAST  139   06,3016  7 4706 0           MASK    BIT5         SEE IF CSC
 0865   REF  27  LAST  155   06,3017  10 000 0           CCS     A
 0866                        06,3020  0 3022 1           TC      +2           CSC-SET SWSAMPLE  POS
 0867   REF   1              06,3021  3 7716 0           CAF     NEGONE       ZOPTICS-SET SWSAMPLE (-1)
 0868   REF   1              06,3022  55'314 1  SETSAMP  TS      SWSAMPLE     CURRENT OPTICS SWITCH SETTING

 0869   REF   1              06,3023  11'315 0  PROCESSW CCS     DESOPMOD     BRANCH ON PREVICUS SETTING
 0870   REF   1              06,3024  0 3125 1           TC      CSCDES       CSC
 0871   REF   1              06,3025  0 3077 1           TC      MANUDES      MANUAL
 0872   REF   1              06,3026  0 3027 1           TC      ZOPTDES      ZERO OPTICS
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0873  REF   2  LAST  155   06,3027  11'314 1  ZOPTDES  CCS   SWSAMPLE   IS SWITCH STILL AT ZOPTICS
0874  REF   1             06,3030  0 3047 1            TC    ZTOCSC     NOW AT CSC
0875  REF   1             06,3031  0 3037 0            TC    ZTOMAN     MANUAL
0876  REF   1             06,3032  0 3057 0            TC    ZOPFINI    ZOPTICS-SEE IF ZOPT PROCESSING
0877  REF   1             06,3033  0 3154 1            TC    SETDESMD   ZOPT NOT PROCESSING-NO ACTION

0878  REF   1             06,3034  11'317 1            CCS   ZOPTCNT    ZOPT PROCESSING-CHECK COUNTER
0879  REF   1             06,3035  0 3153 0            TC    SETCNT     32 SAMPLE NOT FINISHED-SET COUNTER
0880  REF   1             06,3036  0 3157 1            TC    SETZOEND   32 SAMPLE WAIT COMPLETED-SET UP ZOP END

0881  REF   2  LAST  156   06,3037  0 3057 0  ZTOMAN   TC    ZOPFINI    ZOP TO MANUAL-IS ZOPT DONE
0882  REF   2  LAST  156   06,3040  0 3154 1            TC    SETDESMD   YES-NORMAL EXIT

0883  REF   7  LAST  151   06,3041  0 5537 0  ZOPALARM TC    ALARM      ALARM-SWITCHED ALTERED WHILE ZOPTICS
0884                       06,3042  00116 1             OCT   00116
0885  REF   1             06,3043  3 4717 1            CAF   OCT13      PROCESSING-SET RETURN OPTION
0886  REF   1             06,3044  55'316 0            TS    WTOPTION

0887  REF   1             06,3045  0 3070 0            TC    CANZOPT    CANCEL ZOPT

0888  REF   3  LAST  156   06,3046  0 3154 1            TC    SETDESMD

0889  REF   3  LAST  156   06,3047  0 3057 0  ZTOCSC   TC    ZOPFINI    SEE IF ZOPT PROCESSING
0890  REF   1             06,3050  0 3115 1            TC    MANTOCSC +3  NO-CHECK RETURN TO COARS OPT
0891  REF   8  LAST  156   06,3051  0 5537 0            TC    ALARM      ZOPT PROCESSING-ALARM
0892                       06,3052  00116 1             OCT   00116
0893  REF   2  LAST  156   06,3053  0 3070 0            TC    CANZOPT    CANCEL ZOPT
0894  REF   2  LAST  156   06,3054  0 3112 0            TC    MANTOCSC   ZERO CNT-LOCK FOR COARS OPT RETURN

0895  REF  14  LAST  137   06,3055  3 4702 0  COARSLOK CAF   BIT9       IF COARS OPT SINCE FSTART GO TO L+2
0896  REF   1             06,3056  1 3064 1            TCF   ZOPFIN2    IF NOT GO TO L+1
0897  REF  16  LAST  154   06,3057  3 4712 1  ZOPFINI  CAF   BIT1       SEE IF END ZOPT TASK WORKING
0898  REF   6  LAST  155   06,3060  7 1331 0            MASK  OPTMODES
0899  REF  28  LAST  155   06,3061  10 000 0            CCS   A
0900  REF  10  LAST  155   06,3062  0 5222 0            TC    RESUME     ZOPT TASK WORKING-WAIT ONE SAMPLE PERIOD

0901  REF  11  LAST   61   06,3063  3 4710 0            CAF   BIT3       TEST IF ZOPTICS PROCESSING
0902  REF   7  LAST  156   06,3064  7 1331 0  ZOPFIN2  MASK  OPTMODES   RETURNS TO L+1 PROCESSING AND
0903  REF  29  LAST  156   06,3065  10 000 0  ZOPFIN3  CCS   A
0904  REF   6  LAST  153   06,3066  24 002 0            INCR  Q          L+2 IF NOT
0905  REF   7  LAST  156   06,3067  0 0002 0            TC    Q

0906  REF   2  LAST  142   06,3070  4 6211 1  CANZOPT   CS    SIX        CANCEL ZERO OPTICS
0907  REF   8  LAST  156   06,3071  7 1331 0            MASK  OPTMODES   ZERO ZOPT PROCESSING BIT-ENABLE OCDUFAIL
0908  REF   9  LAST  156   06,3072  55'331 0            TS    OPTMODES
0909  REF  17  LAST  156   06,3073  4 4712 0            CS    BIT1       MAKE SURE ZERO CDU IS OFF
0910                       06,3074  0 0006 1            EXTEND
0911  REF  11  LAST  153   06,3075  03 012 1            WAND  CHAN12
0912  REF   8  LAST  156   06,3076  0 0002 0            TC    Q
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0913   REF   3  LAST  156   06,3077  11'314 1  MANUDES  CCS   SWSAMPLE   SEE IF SWITCH STILL IN MANUAL MODE
0914   REF   3  LAST  156   06,3100  0 3112 0           TC    MANTOCSC   NOW AT CSC
0915   REF   1              06,3101  0 3107 1           TC    MANTOMAN   STILL MANUAL
0916   REF   2  LAST  156   06,3102  11'316 C           CCS   WTOPTION   ZOPTICS-LOOK AT ZOPTICS RETURN OPTION
0917                        06,3103  0 3105 C           TC    +2         5 SEC RETURN GOOD-CONTINUE ZOPTICS
0918   REF   1              06,3104  0 3151 1           TC    OPTZERO    ZOPTICS MUST START ANEW

0919   REF   1              06,3105  0 3216 1           TC    INITZOPT   SHOW ZERO OPTICS PROCESSING
0920   REF   4  LAST  156   06,3106  0 3154 1           TC    SETDESMD   NORMAL EXIT

0922   REF   3  LAST  157   06,3107  11'316 C  MANTOMAN CCS   WTOPTION   DECREMENT RETURN OPTION TIME
0923   REF   4  LAST  157   06,3110  55'316 C           TS    WTOPTION
0924   REF   5  LAST  157   06,3111  0 3154 1           TC    SETDESMD

0925   REF   6  LAST  147   06,3112  3 4714 1  MANTOCSC CAF   ZERO       CANCEL ZOPT RETURN OPTION IF SET
0926   REF   5  LAST  157   06,3113  55'316 C           TS    WTOPTION
0927   REF   2  LAST  156   06,3114  55'317 1           TS    ZOPTCNT

0928   REF   1              06,3115  0 3055 1           TC    COARSLOK   CHECK FOR COARS OPT RETURN
0929   REF   6  LAST  157   06,3116  0 3154 1           TC    SETDESMD   NO COARS TASK-NO ACTION

0930   REF   5  LAST  141   06,3117  3 4712 1           CAF   ONE        SET COARS OPT WORKING
0931   REF   2  LAST  155   06,3120  55'303 1           TS    OPTIND
0932   REF  13  LAST  149   06,3121  3 4711 1           CAF   BIT2       ENABLE OPTICS CDU ERROR CNTS
0933                        06,3122  0 0006 1           EXTEND
0934   REF  12  LAST  156   06,3123  05 012 1           WOR   CHAN12

0935   REF   7  LAST  157   06,3124  0 3154 1           TC    SETDESMD

0936   REF   4  LAST  157   06,3125  11'314 1  CSCDES   CCS   SWSAMPLE   SEE IF SWITCH STILL AT CSC
0937   REF   8  LAST  157   06,3126  0 3154 1           TC    SETDESMD   STILL AT CSC
0938   REF   1              06,3127  0 3133 C           TC    CSCTOMAN   MANUAL
0939   REF   1              06,3130  3 4705 1  CSCTOZOP CAF   OCT40      ZOPTICS-INITIALIZE FOR ZOPT
0940   REF   3  LAST  157   06,3131  55'317 1           TS    ZOPTCNT
0941   REF   2  LAST  157   06,3132  0 3216 1           TC    INITZOPT

0942   REF   3  LAST  157   06,3133  11'303 1  CSCTOMAN CCS   OPTIND     SEE IF COARS WORKING
0943   REF   1              06,3134  0 3140 1           TC    CANCCARS   COARS WORKING-SWITCH NOT CSC-KILL COARS
0944   REF   2  LAST  157   06,3135  0 3140 1           TC    CANCCARS
0945                        06,3136  0 3137 1           TC    +1         NO COARS-NORMAL EXIT
0946   REF   9  LAST  157   06,3137  0 3154 1           TC    SETDESMD
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0947  REF   2  LAST  155   06,3140  3 7716 C  CANCOARS CA    NEGONE
0948  REF   4  LAST  157   06,3141  55'303 1            TS    OPTIND     SET OPTIND (-1)  TO SHOW NOT WORKING
0949  REF  14  LAST  157   06,3142  4 4711 C            CS    BIT2       DISABLE OCDU ERR CNTS
0950                       06,3143  0 0006 1            EXTEND
0951  REF  13  LAST  157   06,3144  03 012 1            WAND  CHAN12
0952  REF  10  LAST  156   06,3145  4 1331 C            CS    OPTMODES   SET RETURN-TO-COARS BIT
0953  REF  15  LAST  156   06,3146  7 4702 1            MASK  BIT9
0954  REF  11  LAST  158   06,3147  27'331 C            ADS   OPTMODES

0955  REF  10  LAST  157   06,3150  0 3154 1            TC    SETDESMD
0956  REF   3  LAST  157   06,3151  0 3216 1  OPTZERO   TC    INITZOPT   INITIALIZE ZERO OPTICS

0957  REF   2  LAST  157   06,3152  3 4705 1            CA    OCT40      SET UP 32 SAMPLE WAIT
0958  REF   4  LAST  157   06,3153  55'317 1  SETCNT    TS    ZOPTCNT
0959  REF   5  LAST  157   06,3154  3 1314 C  SETDESMD  CA    SWSAMPLE   SET CURRENT SWITCH INDICATION-RESUME
0960  REF   2  LAST  155   06,3155  55'315 0            TS    DESOPMOD
0961  REF  11  LAST  156   06,3156  0 5222 C            TC    RESUME

0962  REF  18  LAST  156   06,3157  3 4712 1  SETZOEND  CAF   BIT1       SEND ZERO OPTICS CDU
0963                       06,3160  0 0006 1            EXTEND
0964  REF  14  LAST  158   06,3161  05 012 1            WOR   CHAN12
0965  REF   1               06,3162  3 4112 1            CA    200MS      HOLD ZERO CDU FOR 200 MS
0966  REF   5  LAST  142   06,3163  0 5140 1            TC    WAITLIST
0967  REF  12  LAST  158      1331                     EBANK= OPTMODES
0968  REF   1               06,3164   03172 C            2CADR ENDZOPT
0968  REF   1               06,3165   14062 C

0969  REF  13  LAST  158   06,3166  4 1331 C            CS    OPTMODES   SHOW ZOPTICS TASK WORKING
0970  REF  19  LAST  158   06,3167  7 4712 C            MASK  BIT1
0971  REF  14  LAST  158   06,3170  27'331 C            ADS   OPTMODES

0972  REF  11  LAST  158   06,3171  0 3154 1            TC    SETDESMD

0973  REF   1               06,3172  0 3210 1  ENDZOPT   TC    ZEROPCDU   ZERO OCDU COUNTERS
0974  REF  20  LAST  158   06,3173  4 4712 C            CS    BIT1       TURN OFF ZERO OCDU
0975                       06,3174  0 0006 1            EXTEND
0976  REF  19  LAST  158   06,3175  03 012 1            WAND  CHAN12
0977  REF   2  LAST  158   06,3176  3 4112 1            CAF   200MS      DELAY 200MS FOR CDUS TO RESYNCHRONIZE
0978  REF   3  LAST  138   06,3177  0 5161 1            TC    VARDELAY

0979  REF  15  LAST  158   06,3200  4 1331 C            CS    OPTMODES   SHOW ZOPTICS SINCE LAST FRESH START
0980  REF  14  LAST  152   06,3201  7 4701 1            MASK  BIT10          OR RESTART
0981  REF  16  LAST  158   06,3202  27'331 C            ADS   OPTMODES

0982  REF   2  LAST  128   06,3203  4 4716 1            CS    SEVEN      ENABLE OCDUFAIL-SHOW OPTICS COMPLETE
0983  REF  17  LAST  158   06,3204  7 1331 C            MASK  OPTMODES
0984  REF  18  LAST  158   06,3205  55'331 C            TS    OPTMODES

0985  REF   2  LAST  159   06,3206  0 3224 C            TC    OCDUFTST   CHECK OCDU FAIL BIT AFTER ENABLE
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0986   REF   3  LAST  138   06,3207  0 5213 1            TC      TASKOVER

0987   REF   7  LAST  157   06,3210  3 4714 1  ZEROPCDU  CAF     ZERO
0988   REF   2  LAST   36   06,3211  54 036 C            TS      CDUS          ZERO IN CDUS,-20 IN CDUT
09881  REF   1              06,3212  55'307 C            TS      ZONE          INITIALIZE SHAFT MONITOR ZONE
0989   REF   1              06,3213  4 3261 C            CS      20DEGS
0990   REF   2  LAST   36   06,3214  54 035 C            TS      CDUT
0991   REF   9  LAST  156   06,3215  0 0002 C            TC      Q

0992   REF   8  LAST  159   06,3216  3 4714 1  INITZOPT  CAF     ZERO          INITIALIZE ZOPTICS-INHIBIT OCDUFAIL
0993   REF   6  LAST  157   06,3217  55'316 C            TS      WTOPTION      AND SHOW OPTICS PROCESSING
0994   REF  19  LAST  158   06,3220  4 1331 C            CS      OPTMODES      SET ZERO OPTICS PROCESSING
0995   REF   3  LAST  156   06,3221  7 6211 1            MASK    SIX               OPTICS CDU FAIL INHIBITED
0996   REF  20  LAST  159   06,3222  27'331 C            ADS     OPTMODES
0997   REF  10  LAST  159   06,3223  0 0002 C            TC      Q
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0998  REF  16  LAST  155   06,3224  3 4704 C  OCDUFTST CAF    BIT7        SEE IF OCDUFAIL ON OR OFF
0999                       06,3225  0 0006 1           EXTEND
1000  REF   3  LAST  155   06,3226  02 030 C           RAND    CHAN30
1001  REF  30  LAST  156   06,3227  10 000 C           CCS     A
1002  REF   1             06,3230  1 3252 C           TCF     OPFAILOF    OCDUFAIL LIGHT OFF

1003  REF  15  LAST  158   06,3231  3 4711 1           CAF     BIT2        OCDUFAIL LIGHT ON UNLESS INHIBITED
1004  REF  21  LAST  159   06,3232  7 1331 C           MASK    OPTMODES
1005  REF  31  LAST  160   06,3233  10 000 C           CCS     A
1006  REF  11  LAST  159   06,3234  0 0002 C           TC      Q           OCDUFAIL INHIBITED

1007  REF  14  LAST  137   06,3235  3 4703 1  OPFAILON CAF    BIT8        ON BIT
1008  REF  13  LAST  153   06,3236  6 1036 C           AD      DSPTAB +11D
1009  REF  15  LAST  160   06,3237  7 4703 C           MASK    BIT8
1010                       06,3240  0 0006 1  SETOFF   EXTEND
1011  REF   1             06,3241  1 6711 1           BZF     TCQ         NO CHANGE

1012  REF   3  LAST  140   06,3242  54 001 1           TS      L
1013  REF  14  LAST  160   06,3243  3 1036 C           CA      DSPTAB +11D
1014                       06,3244  0 0006 1           EXTEND
1015  REF   7  LAST  155   06,3245  06 001 C           RXOR    LCHAN
1016  REF   2  LAST  144   06,3246  7 4672 1           MASK    POSMAX
1017  REF  14  LAST  149   06,3247  6 4674 C           AD      BIT15       SHOW ACTION WANTED
1018  REF  15  LAST  160   06,3250  55'036 1           TS      DSPTAB +11D
1019  REF  12  LAST  160   06,3251  0 0002 C           TC      Q

1020  REF  21  LAST  158   06,3252  3 4712 1  OPFAILOF CAF    BIT1        DONT TURN OFF IF LAMP TEST
1021  REF  16  LAST  154   06,3253  7 1321 1           MASK    IMODES33
1022  REF  32  LAST  160   06,3254  10 000 C           CCS     A
1023  REF  13  LAST  160   06,3255  0 0002 C           TC      Q           LAMP TEST IN PROGRESS

1024  REF  16  LAST  160   06,3256  3 4703 1           CAF     BIT8        TURN OFF OCDUFAIL LIGHT
1025  REF  16  LAST  160   06,3257  7 1036 1           MASK    DSPTAB +11D
1026  REF   1             06,3260  1 3240 C           TCF     SETOFF

1027  REF   1                4717                OCT13    =       ELEVEN
1028  REF   3  LAST  153     4722                OCTHIRTY EQUALS BIT5&6
1029                       06,3261    16037 1    200EGS   DEC     7199
1030  REF  19  LAST  153     4705                OCT40    EQUALS BIT6
1031  REF   1                4112                200MS    EQUALS OCT24
```

P1032 OPTICS CDU DRIVING PROGRAM

```
1033                          10,2000                    BANK    10
1034  REF   1                 10,2000                    SETLOC  OPTDRV
1035                          10,2000                    BANK
1036  REF   1                                            COUNT*  $$/SXT

R1037 SHAFT STOP MONITOR-ZONE UPDATE

1038  REF   3  LAST  159      10,2000  3 0036 1  OPTDRIVE CA      CDUS        GRAB OPTIC SHAFT CDU
1039  REF   4  LAST  16C      10,2001  54 001 1            TS      L
1040  REF  33  LAST  16C      10,2002  10 000 C            CCS     A           GET ABS(CDUS)
1041  REF   1                 10,2003  6 7707 C            AD      13,14,15
1042                          10,2004  1 2006 1            TCF     +2          ABS(CDUS) - 45 DEG
1043                          10,2005  1 2003 1            TCF     -2
1044                          10,2006  0 0006 1            EXTEND
1045  REF   1                 10,2007  6 2016 1            BZMF    OZONE       LESS THAN 45 DEG-SET ZONE 0
1046  REF   2  LAST  159      10,2010  3 1307 1            CA      ZONE        IF ZONE ZERO, CHANGE TO + OR - OTHERWISE
1047                          10,2011  0 0006 1            EXTEND              DONT MESS WITH ZONE
1048                          10,2012  1 2014 1            BZF     +2
1049  REF   1                 10,2013  1 2020 C            TCF     CONTDRVE    JUST CONTINUE
1050  REF   5  LAST  161      10,2014  56 001 C            XCH     L           GREATER THAN 45 DEG-SET ZONE TO SIGN CDU
1051  REF   2  LAST  161      10,2015  1 2017 1            TCF     OZONE +1
1052  REF   9  LAST  159      10,2016  3 4714 1  OZONE     CAF     ZERO        ABS(CDUS) LESS THEN 90 DEG-ZONE ZERO
1053  REF   3  LAST  161      10,2017  55'307 C            TS      ZONE
1054  REF   1                                            COUNT*  $$/T4RPT
1055  REF   5  LAST  158      10,2020  11'303 1  CONTDRVE CCS     OPTIND
1056                          10,2021  0 2025 1            TC      +4          WORK COARS OPTICS
1057                          10,2022  0 2025 1            TC      +3          WORK COARS OPTICS
1058  REF  12  LAST  158      10,2023  0 5222 C            TC      RESUME      NO OPT
1059  REF  13  LAST  161      10,2024  0 5222 C            TC      RESUME      NO OPT

1060  REF   6  LAST  15E      10,2025  3 1314 C            CA      SWSAMPLE    SEE IF SWITCH AT CMC
1061                          10,2026  0 0006 1            EXTEND
1062  REF  14  LAST  161      10,2027  6 5222 C            BZMF    RESUME      ZERO  (-1)          MANUAL  (+0)

1063  REF  15  LAST  158      10,2030  3 4701 C            CAF     BIT1C       SEE IF OCDUS ZEROED SINCE LAST FSTART
1064  REF  22  LAST  16C      10,2031  7 1331 C            MASK    OPTMODES
1065  REF  34  LAST  161      10,2032  1C 000 C            CCS     A
1066                          10,2033  0 2036 C            TC      +3
1067  REF   9  LAST  156      10,2034  0 5537 C            TC      ALARM       OPTICS NOT ZEROED
1068                          10,2035   00120 1            OCT     00120

1069  REF  16  LAST  16C      10,2036  3 4711 1            CA      BIT2        SEE IF ERR CNTS ENABLED
1070                          10,2037  0 0006 1            EXTEND
1071  REF  16  LAST  15E      10,2040  02 012 C            RAND    CHAN12
1072                          10,2041  0 0006 1            EXTEND
1073  REF   1                 10,2042  1 2175 1            BZF     SETBIT      CNTS NOT ENABLED-DO IT AND RESUME

1074  REF   6  LAST  157      10,2043  3 4712 1            CAF     ONE         INITIALIZE OPTIND
```

```
1075   REF   6 LAST 161   10,2044  55'303 1  OPT2     TS      OPTIND
1076                      10,2045  0 0006 1           EXTEND
1077   REF   1            10,2046  1 2132 1           BZF     TRUNCMD        CHECK TRUNION COMMAND

1078   REF   7 LAST 162   10,2047  51'303 C  GETOPCMD INDEX   OPTIND
1079   REF   2 LAST  95   10,2050  3 1160 1           CA      DESOPTT        PICK UP DESIRED OPT ANGLE
1080                      10,2051  0 0006 1           EXTEND
1081   REF   8 LAST 162   10,2052  5 1303 C           INDEX   OPTIND
1082   REF   3 LAST 159   10,2053  20 035 C           MSU     CDUT           GET DIFFERENCE
1083                      10,2054  0 0006 1           EXTEND
1084   REF  13 LAST 147   10,2055  7 4676 C           MP      BIT13
1085   REF   6 LAST 161   10,2056  56 001 C           XCH     L
1086                      10,2057  6 0000 1           DOUBLE
1087   REF   3 LAST  65   10,2060  54 061 1           TS      ITEMP1
1088                      10,2061  1 2063 1           TCF     +2             NO OVFL

1089   REF   7 LAST 162   10,2062  26 001 1           ADS     L              WITH OVFL
1090   REF   9 LAST 162   10,2063  51'303 C  STORCMD  INDEX   OPTIND
1091   REF   1            10,2064  23'305 C           LXCH    COMMANDD       STORE COMMAND
1092   REF  10 LAST 162   10,2065  11'303 1           CCS     OPTIND
1093   REF   1            10,2066  1 2044 1           TCF     OPT2           GET NEXT COMMAND

1094   REF   4 LAST 162   10,2067  54 061 1           TS      ITEMP1         INITIALIZE SEND INDICATOR TO ZERO
1095   REF   2 LAST 161 TO 161:    16    16*          COUNT*  $$/SXT
```

R1096 SHAFT STOP AVOIDANCE

```
10961  REF   4 LAST 161   10,2070  10 036 C           CCS     CDUS           IF CDUS GREATER THAN +OR- 90 DEG CHECK
10962  REF   1            10,2071  6 4673 1           AD      NEG1/2          FOR POSSIBLE STOP PROBLEM
10963                     10,2072  1 2074 1           TCF     +2
10964                     10,2073  1 2071 1           TCF     -2
10965                     10,2074  0 0006 1           EXTEND
10966  REF   1            10,2075  6 2122 1           BZMF    CMDSETUP       CDUS LESS THAN 90 DEG, NO PROBLEMS

1097   REF   4 LAST 161   10,2076  3 1307 1           CA      ZONE
1098                      10,2077  0 0006 1           EXTEND
1099   REF   2 LAST 162   10,2100  1 2122 C           BZF     CMDSETUP       ZONE=3,NORMAL COMMAND
1100   REF  15 LAST 160   10,2101  7 4674 1           MASK    BIT15          GRAB SIGN OF ZONE
1101   REF   8 LAST 162   10,2102  54 001 1           TS      L
1102   REF   2 LAST 162   10,2103  3 1306 C           CA      COMMANDD +1
1103   REF  16 LAST 162   10,2104  7 4674 1           MASK    BIT15          GRAB SIGN OF SHAFT COMMAND
1104                      10,2105  0 0006 1           EXTEND
1105   REF   8 LAST 160   10,2106  06 001 C           RXOR    LCHAN
1106   REF  35 LAST 161   10,2107  10 000 C           CCS     A
1107   REF   3 LAST 162   10,2110  1 2122 C           TCF     CMDSETUP       SIGN ZONE NOT EQUAL TO SIGN COMMAND
1108   REF   2 LAST  95   10,2111  11'161 1           CCS     DESOPTS        SEE IF DESOPTS BETWEEN -90 AND +90
1109   REF   2 LAST 162   10,2112  6 4673 1           AD      NEG1/2
1110                      10,2113  1 2115 1           TCF     +2             ABS(DESOPTS) - 90 DEG
1111                      10,2114  1 2112 C           TCF     -2
1112                      10,2115  0 0006 1           EXTEND
```

```
1113                          10,2116  6 2120 C          BZMF   +2              DESOPTS IN FIRST OR FOURTH QUAD
1114   REF   4 LAST 162      10,2117  1 2122 C          TCF    CMDSETUP
1115   REF   3 LAST 162      10,2120  4 1306 1          CS     COMMANDO +1     REVERSE REGULAR COMMAND
1116   REF   4 LAST 163      10,2121  55'306 1          TS     COMMANDO +1

1117   REF   2 LAST 161 TO 162:    40    40*           COUNT* $$/T4RPT

1118   REF   7 LAST 161      10,2122  3 4712 1  CMDSETUP CAF    ONE             SET OPTIND
1119   REF  11 LAST 162      10,2123  55'303 1          TS     OPTIND
1120   REF  36 LAST 162      10,2124  50 000 1          INDEX  A
1121   REF   5 LAST 163      10,2125  11'305 1          CCS    COMMANDO        GET SIGN OF COMMAND
1122   REF   1               10,2126  0 2144 1          TC     POSOPCMD
1123   REF   1               10,2127  0 2151 C          TC     NEXTOPT +1      ZERO COMMAND-SKIP SEND INDICATOR
1124   REF   1               10,2130  0 2161 C          TC     NEGOPCMD
1125   REF   2 LAST 163      10,2131  0 2151 C          TC     NEXTOPT +1      ZERO COMMAND

1126   REF   4 LAST 162      10,2132  4 0035 C  TRUNCMD  CS     CDUT            IF COMMAND GREATER THAN 45 DEG-COMMAND
1127   REF   3 LAST 162      10,2133  6 1160 1          AD     DESOPTT         45 DEG
1128   REF  14 LAST 160      10,2134  54 002 1          TS     Q
1129   REF   1               10,2135  0 2047 C          TC     GETOPCMD        LESS THAN 45 DEG-NORMAL OPERATION

1130   REF  37 LAST 163      10,2136  10 000 C          CCS    A               GREATER THAN 45 DEG-USE OPSMAX WITH
1131   REF   3 LAST 160      10,2137  3 4672 C          CA     POSMAX          CORRECT SIGN
1132                         10,2140  0 2142 1          TC     +2
1133   REF   4 LAST 163      10,2141  4 4672 1          CS     POSMAX
1134   REF   9 LAST 162      10,2142  54 001 1          TS     L
1135   REF   1               10,2143  0 2063 C          TC     STORCMD
1136   REF   1               10,2144  6 2202 C  POSOPCMD AD     MAXPLS1
1137                         10,2145  0 0006 1          EXTEND
1138   REF   1               10,2146  6 2166 1          BZMF   DELOPCMD        COMMAND LESS THAN MAX PULSE
1139   REF   1               10,2147  4 2201 1          CS     MAXPLS          GREATER THAN MAX PULSE-USE MAX PULSE

1140   REF   5 LAST 162      10,2150  24 061 C  NEXTOPT INCR   ITEMP1          SET SEND INDICATOR
1141   REF   2 LAST 130      10,2151  6 4713 C          AD     NEGO            MAKE SURE ZERO COMMAND IS -ZERO
1142   REF  12 LAST 163      10,2152  51'303 C          INDEX  OPTIND
1143   REF   3 LAST  37      10,2153  54 053 C          TS     CDUTCMD         STORE PULSE IN SEND REG

1144   REF  13 LAST 163      10,2154  11'303 1          CCS    OPTIND
1145   REF   5 LAST 163      10,2155  0 2123 C          TC     CMDSETUP +1     GET NEXT OPT

1146   REF   6 LAST 163      10,2156  10 061 1          CCS    ITEMP1          ARE ANY PULSES TO GO
1147   REF   1               10,2157  1 2171 C          TCF    SENDCCMD        YES-SEND EM
1148   REF  15 LAST 161      10,2160  0 5222 C          TC     RESUME          NO

1149   REF   2 LAST 163      10,2161  6 2202 C  NEGOPCMD AD     MAXPLS1
1150                         10,2162  0 0006 1          EXTEND
1151   REF   2 LAST 163      10,2163  6 2166 1          BZMF   DELOPCMD        LESS THAN MAX PULSE
1152   REF   2 LAST 163      10,2164  3 2201 C          CA     MAXPLS          MAX PULSES
1153   REF   3 LAST 163      10,2165  1 2150 C          TCF    NEXTOPT
```

```
1154   REF  14  LAST  163   10,2166  51'303 C  DELQPCMD  INDEX  OPTIND
1155   REF   6  LAST  163   10,2167  57'305 C            XCH    COMMANDQ     SET UP SMALL COMMAND
1156   REF   4  LAST  163   10,2170  1 2150 C            TCF    NEXTOPT

1157   REF   1              10,2171  3 4755 1  SENDQCMD  CAF    11,12        SEND QCDU DRIVE COMMANDS
1158                        10,2172  0 0006 1            EXTEND
1159   REF   3  LAST  147   10,2173  05 014 1            WOR    CHAN14
1160   REF  16  LAST  163   10,2174  0 5222 C            TC     RESUME

1161   REF  17  LAST  161   10,2175  3 4711 1  SETBIT    CAF    BIT2         ENABLE QCDU ERR CNTS
1162                        10,2176  0 0006 1            EXTEND
1163   REF  17  LAST  161   10,2177  05 012 1            WOR    CHAN12
1164   REF  17  LAST  164   10,2200  0 5222 C            TC     RESUME       START  COARS NEXT TIME AROUND

1165                        10,2201   77532 C  MAXPLS     DEC    -165         WAS  -80
1166                        10,2202   77533 1  MAXPLS1    DEC    -164         WAS  -79
1167   REF   1                4755             11,12     EQUALS PRIOD
```

L DOWNLINK LISTS USER'S PAGE NO. 1 EO S3

```
0001                        22,2000         BANK   22
0002   REF   1              05,2000         SETLOC DOWNTELM
0003                        05,2000         BANK

0004   REF   2  LAST  127    0340           EBANK= DNTMBUFF

R0005  SPECIAL DOWNLINK CP CODES
A0006                                      CP CODE ADDRESS(EXAMPLE) SENDS..     BIT 15  BITS 14-12 BITS 11
A0007                                                                                                -0
A0008                                      ------ ----------        ----------  ------  ---------- -------
A0009                                                                                                --
A0010                                      1DNADR TIME2            (2 AGC WDS)    0         0      ECADR
A0011                                      2DNADR TEPHEM           (4 AGC WDS)    0         1      ECADR
A0012                                      3DNADR VGBODY           (6 AGC WDS)    0         2      ECADR
A0013                                      4DNADR STATE            (8 AGC WDS)    0         3      ECADR
A0014                                      5DNADR UPBUFF           (10AGC WDS)    0         4      ECADR
A0015                                      6DNADR DSPTAB           (12AGC WDS)    0         5      ECADR
A0016                                      DNCHAN 30               CHANNELS       0         7      CHANNEL
A0017                                                                                               ADDRESS
A0018                                      DNPTR  NEXTLIST         POINTS TO NEXT 0         6      ADRES
A0019                                                               LIST.

R0020  DOWNLIST FORMAT DEFINITIONS AND RULES-
R0021  1. END OF A LIST = -XDNADR (X = 1 TO 6), -DNPTR, OR -DNCHAN.
R0022  2. SNAPSHOT SUBLIST = LIST WHICH STARTS WITH A -1DNADR.
R0023  3. SNAPSHOT SUBLIST CAN ONLY CONTAIN 1DNADRS.
R0024  4. TIME2 1DNADR MUST BE LOCATED IN THE CONTROL LIST OF A DOWNLIST.
R0025  5. ERASABLE DOWN TELEMETRY WORDS SHOULD BE GROUPED IN SEQUENTIAL
R0026     LOCATIONS AS MUCH AS POSSIBLE TO SAVE STORAGE USED BY DOWNLINK LISTS.
R00261 6. THE DOWNLINK LISTS(INCLUDING SUBLISTS) ARE ORGANIZED SUCH THAT THE ITEMS LISTED FIRST(IN FRONT OF FBANK) ARE
R00263    SENT FIRST. EXCEPTION--- SNAPSHOT SUBLISTS. IN THE SNAPSHOT SUBLISTS THE DATA REPRESENTED BY THE FIRST
R00265    11 1DNADRS IS PRESERVED (IN ORDER) IN DNTMBUFF AND SENT BY THE NEXT 11 DOWNRUPTS. THE DATA REPRESENTED BY THE
R00267    LIST IS SENT IMMEDIATELY.
R00268

0027   REF   1                                  COUNT  05/DLIST
0028                       0007                ERASZERO EQUALS 7
0029   REF   1             0007                SPARE    EQUALS ERASZERO      USE SPARE TO INDICATE AVAILABLE SPACE
0030                    05,2000   77340 0      LOWIDCOD OCT    77340         LOW ID CODE

0031   REF   1          05,2113                NOMDNLST EQUALS CMCSTADL      FRESH START AND POST P27 DOWNLIST
0032   REF   1          05,2214                UPDNLIST EQUALS CMENTRDL      UPDATE PROGRAM (P27) DOWNLIST
```

L DOWNLINK LISTS USER'S PAGE NO. 2 EO S3

P0033 CSM POWERED FLIGHT DOWNLIST

R0034 ----------CONTROL LIST----------

```
0035                          05,2001          CMPOWEDL EQUALS
0036  REF   1                 05,2001  32047 0         DNPTR  CMPOWE01      COLLECT SNAPSHOT
0037  REF   3  LAST  165      05,2002  24340 0         6DNADR DNTMBUFF      SEND SNAPSHOT
0038  REF   1                 05,2003  32056 0         DNPTR  CMPOWE02      COLLECT SECOND SNAPSHOT
0039  REF   4  LAST  166      05,2004  14340 0         4DNADR DNTMBUFF      SEND SNAPSHOT
0040  REF   1                 05,2005  32063 0         DNPTR  CMPOWE03      COMMON DATA
0041  REF   3  LAST  125      05,2006  03412 0         1DNADR TIG           TIG,+1
0042  REF   2  LAST  114      05,2007  03422 0         1DNADR DELLT4        DELLT4,+1
0043  REF   2  LAST  114      05,2010  13414 1         3DNADR RTARG         RTARG,+1,+2,...+5
0044  REF   2  LAST  114      05,2011  03427 0         1DNADR TGO           TGO,+1
0045  REF   2  LAST   76      05,2012  01245 0         1DNADR PIPTIME1      PIPTIME1,+1
0046  REF   4  LAST   76      05,2013  11162 1         3DNADR DELV          DELV,+1,...+4,+5
0047  REF   1                 05,2014  03025 0         1DNADR PACTOFF       PACTOFF,YACTOFF
0048  REF   2  LAST  101      05,2015  03231 1         1DNADR PCMD          PCMD,YCMD
0049  REF   2  LAST  121      05,2016  03702 1         1DNADR CSTEER        CSTEER,+1
0050  REF   1                 05,2017  00007 0         1DNADR SPARE
0051  REF   2  LAST  166      05,2020  00007 0         1DNADR SPARE
0052  REF   3  LAST  166      05,2021  00007 0         1DNADR SPARE
0053  REF   1                 05,2022  25735 1         6DNADR REFSMMAT      REFSMMAT,+1,...+10,+11
0054  REF   1                 05,2023  32065 0         DNPTR  CMPOWE04      COMMON DATA
0055  REF   1                 05,2024  00024 1         1DNADR TIME2         TIME2,TIME1
0056  REF   1                 05,2025  32067 1         DNPTR  CMPOWE05      COLLECT SNAPSHOT
0057  REF   5  LAST  166      05,2026  24340 0         6DNADR DNTMBUFF      SEND SNAPSHOT
0058  REF   2  LAST  166      05,2027  32056 0         DNPTR  CMPOWE02      COLLECT SNAPSHOT
0059  REF   6  LAST  166      05,2030  14340 0         4DNADR DNTMBUFF      SEND SNAPSHOT
0060  REF   2  LAST  166      05,2031  32063 0         DNPTR  CMPOWE03
0061  REF   1                 05,2032  32076 1         DNPTR  CMPOWE06      COMMON DATA
0062  REF   2  LAST  123      05,2033  03743 1         1DNADR ELEV          ELEV,+1
00620 5 REF   1                 05,2034  03753 0         1DNADR CENTANG       CENTANG,+1
00621 REF   2  LAST   90      05,2035  02610 1         1DNADR DELTAR        DELTAR,+1
0063  REF  18  LAST  145      05,2036  00106 0         1DNADR STATE +10D    FALGWRDS 10 AND 11
0064  REF   2  LAST   78      05,2037  01336 0         1DNADR TEVENT        TEVENT,+1
0065  REF   3  LAST  166      05,2040  03231 1         1DNADR PCMD          PCMD,YCMD
0066  REF  23  LAST  161      05,2041  01331 1         1DNADR OPTMODES      OPTMODES,HOLDFLAG
0067  REF   1                 05,2042  32101 0         DNPTR  CMPOWE07      COMMON DATA
0068  REF   3  LAST  121      05,2043  13720 0         3DNADR VGTIG         VGTIG,+1,...+4,+5
0069  REF   4  LAST  166      05,2044  00007 0         1DNADR SPARE
0070  REF   5  LAST  166      05,2045  00007 0         1DNADR SPARE
0071  REF   6  LAST  166      05,2046  77770 1        -1DNADR SPARE
```

R0072 ----------SUB LISTS----------

```
0073  REF   1                 05,2047  76605 0  CMPOWE01-1DNADR RN +2        RN+2,+3          SNAPSHOT DATA
0074  REF   2  LAST  166      05,2050  01174 1         1DNADR RN +4         RN+4,+5
0075  REF   1                 05,2051  01176 0         1DNADR VN            VN,+1
0076  REF   2  LAST  166      05,2052  01200 1         1DNADR VN +2         VN+2,+3
```

0077	REF	3	LAST	166	05,2053	01202	C		1DNADR VN +4	VN+4,+5
0078	REF	2	LAST	76	05,2054	01204	C		1DNADR PIPTIME	PIPTIME,+1
0079	REF	3	LAST	166	05,2055	76607	1		-1DNADR RN	RN,+1
0080	REF	2	LAST	142	05,2056	77743	1	CMPOWE02	-1DNADR CDUZ	CDUZ,CDUT SNAPSHOT DATA
0081	REF	3	LAST	113	05,2057	03133	0		1DNADR ADOT	ADOT,+1/OGARATE,+1
0082	REF	4	LAST	167	05,2060	03135	C		1DNADR ADOT +2	ADOT+2,+3/OMEGAB+2,+3
0083	REF	5	LAST	167	05,2061	03137	1		1DNADR ADOT +4	ADOT+4,+5/OMEGAB+4,+5
0084	REF	1			05,2062	77745	1		-1DNADR CDUX	CDUX,CDUY
0085	REF	2	LAST	11C	05,2063	07076	1	CMPOWE03	2DNADR AK	AK,AK1,AK2,RCSFLAGS COMMON DATA
0086	REF	3	LAST	11C	05,2064	70605	0		-2DNADR THETADX	THETADX,THETADY,THETADZ,GARBAGE
0087	REF	19	LAST	166	05,2065	20074	C	CMPOWE04	5DNADR STATE	FLAGWRD0 THRU FLAGWRD9 COMMON DATA
0088	REF	17	LAST	16C	05,2066	52754	C		-6DNADR DSPTAB	DISPLAY TABLES
0089	REF	1			05,2067	76054	1	CMPOWE05	-1DNADR R-OTHER +2	R-OTHER+2,+3 SNAPSHOT DATA
0090	REF	2	LAST	167	05,2070	01725	C		1DNADR R-OTHER +4	R-OTHER+4,+5
0091	REF	1			05,2071	01727	1		1DNADR V-OTHER	V-OTHER,+1
0092	REF	2	LAST	167	05,2072	01731	C		1DNADR V-OTHER +2	V-OTHER+2,+3
0093	REF	3	LAST	167	05,2073	01733	1		1DNADR V-OTHER +4	V-OTHER+4,+5
0094	REF	1			05,2074	01642	C		1DNADR T-OTHER	T-OTHER,+1
0095	REF	3	LAST	167	05,2075	76056	C		-1DNADR R-OTHER	R-OTHER,+1
0096	REF	1			05,2076	01432	C	CMPOWE06	1DNADR RSBBQ	RSBBQ,+1 COMMON DATA
0097	REF	1			05,2077	10372	C		3DNADR CADRFLSH	CADRFLSH,+1,+2,FAILREG,+1,+2
0098	REF	5	LAST	162	05,2100	73741	1		-2DNADR CDUS	CDUS,PIPAX,PIPAY,PIPAZ
0099	REF	2	LAST	99	05,2101	03073	C	CMPOWE07	1DNADR LEMMASS	LEMMASS,CSMMASS COMMON DATA
0100	REF	1			05,2102	03066	1		1DNADR DAPDATR1	DAPDATR1,DAPDATR2
0101	REF	3	LAST	11C	05,2103	07167	C		2DNADR ERRORX	ERRORX,ERRORY,ERRORZ,GARBAGE
0102	REF	4	LAST	113	05,2104	13125	C		3DNADR WBODY	WBODY,...+5/OMEGAC,...+5
0103	REF	1			05,2105	05154	1		2DNADR REDOCTR	REDOCTR,THETAD,+1,+2
0104	REF	32	LAST	153	05,2106	01320	1		1DNADR IMODES30	IMODES30,IMODES33
0105					05,2107	34011	C		DNCHAN 11	CHANNELS 11,12
0106					05,2110	34013	1		DNCHAN 13	CHANNELS 13,14
0107					05,2111	34030	C		DNCHAN 30	CHANNELS 30,31
0108					05,2112	43745	C		-DNCHAN 32	CHANNELS 32,33

R0109 ----------

P0110 CSM COAST AND ALIGNMENT DOWNLIST

R0111 ----------CONTROL LIST----------

0112					05,2113		CMCSTADL	EQUALS	SEND ID BY SPECIAL CODING
0113	REF	1			05,2113	32047 C		DNPTR CMCSTA01	COLLECT SNAPSHOT
0114	REF	7	LAST	166	05,2114	24340 C		6DNADR DNTMBUFF	SEND SNAPSHOT
0115	REF	1			05,2115	32056 C		DNPTR CMCSTA02	COLLECT SECOND SNAPSHOT
0116	REF	8	LAST	168	05,2116	14340 C		4DNADR DNTMBUFF	SEND SNAPSHOT
0117	REF	1			05,2117	32063 C		DNPTR CMCSTA03	COMMON DATA
0118	REF	4	LAST	166	05,2120	03412 C		1DNADR TIG	TIG,+1
0119	REF	2	LAST	69	05,2121	00302 C		1DNADR BESTI	BESTI,BESTJ
0120	REF	4	LAST	122	05,2122	17674 1		4DNADR MARKDOWN	MARKDOWN,+1...+5,+6,GARBAGE
0121	REF	1			05,2123	17502 C		4DNADR MARK2DWN	MARK2DWN,+1...+5,+6
0123	REF	2	LAST	89	05,2124	06363 1		2DNADR HAPO	HAPO,+1,HPER,+1
0124	REF	1			05,2125	02355 C		1DNADR RSP-RREC	RSP-RREC,+1
0125	REF	4	LAST	166	05,2126	13720 C		3DNADR VGTIG	VGTIG,...+5
0126	REF	2	LAST	166	05,2127	25735 1		6DNADR REFSMMAT	REFSMMAT,+1,...+10,+11
0127	REF	1			05,2130	32065 C		DNPTR CMCSTA04	COMMON DATA
0128	REF	2	LAST	166	05,2131	00024 1		1DNADR TIME2	TIME2,TIME1
0129	REF	1			05,2132	32067 1		DNPTR CMCSTA05	COLLECT SNAPSHOT
0130	REF	9	LAST	168	05,2133	24340 C		6DNADR DNTMBUFF	SEND SNAPSHOT
0131	REF	2	LAST	168	05,2134	32056 C		DNPTR CMCSTA02	COLLECT SNAPSHOT
0132	REF	10	LAST	168	05,2135	14340 C		4DNADR DNTMBUFF	SEND SNAPSHOT
0133	REF	2	LAST	168	05,2136	32063 C		DNPTR CMCSTA03	COMMON DATA
0134	REF	1			05,2137	32076 1		DNPTR CMCSTA06	COMMON DATA
0135	REF	2	LAST	92	05,2140	12757 1		3DNADR OGC	OGC,+1,IGC,+1,MGC,+1
0136	REF	20	LAST	167	05,2141	00106 C		1DNADR STATE +10D	FALGWRDS 10 AND 11
0137	REF	3	LAST	166	05,2142	01336 C		1DNADR TEVENT	TEVENT,+1
0138	REF	1			05,2143	02633 C		1DNADR LAUNCHAZ	LAUNCHAZ,+1
0139	REF	24	LAST	166	05,2144	01331 1		1DNADR OPTMODES	OPTMODES,HOLDFLAG
0140	REF	1			05,2145	32101 C		DNPTR CMCSTA07	COMMON DATA
0141	REF	18	LAST	167	05,2146	52754 C		-6DNADR DSPTAB	DISPLAY TABLES

R0142 ----------SUB LISTS----------

0143	REF	2	LAST	166	05,2047	CMCSTA01 EQUALS CMPOWE01		COMMON DOWNLIST DATA
0144	REF	3	LAST	166	05,2056	CMCSTA02 EQUALS CMPOWE02		COMMON DOWNLIST DATA
0145	REF	3	LAST	166	05,2063	CMCSTA03 EQUALS CMPOWE03		COMMON DOWNLIST DATA
0146	REF	2	LAST	166	05,2065	CMCSTA04 EQUALS CMPOWE04		COMMON DOWNLIST DATA
0147	REF	2	LAST	166	05,2067	CMCSTA05 EQUALS CMPOWE05		COMMON DOWNLIST DATA
0148	REF	2	LAST	166	05,2076	CMCSTA06 EQUALS CMPOWE06		COMMON DOWNLIST DATA
0149	REF	2	LAST	166	05,2101	CMCSTA07 EQUALS CMPOWE07		COMMON DOWNLIST DATA

L DOWNLINK LISTS USER'S PAGE NO. 5 EO S3

R0150 ----------

P0151 CSM RENDEZVOUS AND PRETHRUST LIST

R0152 ----------CONTROL LIST----------

0153					05,2147		CMRENDDL	EQUALS	SEND ID BY SPECIAL CODING
0154	REF	1			05,2147	32047 C		DNPTR CMRENDO1	COLLECT SNAPSHOT
0155	REF	11	LAST	168	05,2150	24340 C		6DNADR DNTMBUFF	SEND SNAPSHOT
0156	REF	1			05,2151	32056 C		DNPTR CMRENDO2	COLLECT SECOND SNAPSHOT
0157	REF	12	LAST	17C	05,2152	14340 C		4DNADR DNTMBUFF	SEND SNAPSHOT
0158	REF	1			05,2153	32063 C		DNPTR CMRENDO3	COMMON DATA
0159	REF	5	LAST	168	05,2154	03412 C		1DNADR TIG	TIG,+1
0160	REF	3	LAST	166	05,2155	03422 0		1DNADR DELLT4	DELLT4,+1
0161	REF	3	LAST	166	05,2156	13414 1		3DNADR RTARG	RTARG,+1...+4,+5
0162	REF	1			05,2157	01151 C		1DNADR VHFTIME	VHFTIME,+1
0163	REF	5	LAST	168	05,2160	17674 1		4DNADR MARKDOWN	MARKTIME(DP),YCDU,SCDU,ZCDU,TCDU,XCDU,RM
0164	REF	1			05,2161	01125 C		1DNADR VHFCNT	VHFCNT,+1
0165	REF	2	LAST	121	05,2162	03662 C		1DNADR TTPI	TTPI,+1
0166	REF	1			05,2163	03424 C		1DNADR ECSTEER	ECSTEER,+1
0167	REF	2	LAST	9C	05,2164	02636 C		1DNADR DELVTPF	DELVTPF,+1
0168	REF	7	LAST	166	05,2165	00007 C		1DNADR SPARE	
0169	REF	8	LAST	17C	05,2166	00007 C		1DNADR SPARE	
0170	REF	3	LAST	12C	05,2167	03655 1		1DNADR TPASS4	TPASS4,+1
0171	REF	3	LAST	114	05,2170	13404 0		3DNADR DELVSLV	DELVSLV,+1...+4,+5
0172	REF	5	LAST	88	05,2171	06320 C		2DNADR RANGE	RANGE,+1,RRATE,+1
0173	REF	1			05,2172	32065 C		DNPTR CMRENDO4	COMMON DATA
0174	REF	3	LAST	168	05,2173	00024 1		1DNADR TIME2	TIME2,TIME1
0175	REF	1			05,2174	32067 1		DNPTR CMRENDO5	COLLECT SNAPSHOT
0176	REF	13	LAST	17C	05,2175	24340 C		6DNADR DNTMBUFF	SEND SNAPSHOT
0177	REF	2	LAST	17C	05,2176	32056 C		DNPTR CMRENDO2	COLLECT SNAPSHOT
0178	REF	14	LAST	17C	05,2177	14340 C		4DNADR DNTMBUFF	SEND SNAPSHOT
0179	REF	2	LAST	17C	05,2200	32063 C		DNPTR CMRENDO3	COMMON DATA
0180	REF	1			05,2201	32076 1		DNPTR CMRENDO6	COMMON DATA
0181	REF	3	LAST	166	05,2202	03743 1		1DNADR ELEV	ELEV,+1
0181C3	REF	2	LAST	166	05,2203	03753 C		1DNADR CENTANG	CENTANG,+1
0181C6	REF	3	LAST	166	05,2204	02610 1		1DNADR DELTAR	DELTAR,+1
0182	REF	3	LAST	124	05,2205	13645 1		3DNADR DELVEET3	DELVEET3,+1,...+4,+5
0183	REF	25	LAST	168	05,2206	01331 1		1DNADR OPTMODES	OPTMODES,HOLDFLAG
0184	REF	1			05,2207	32101 0		DNPTR CMRENDO7	COMMON DATA
0185	REF	2	LAST	87	05,2210	02324 C		1DNADR RTHETA	RTHETA,+1
0186	REF	2	LAST	114	05,2211	07400 1		2DNADR LAT(SPL)	LAT(SPL),LNG(SPL),+1
0187	REF	3	LAST	117	05,2212	07766 1		2DNADR VPRED	VPRED,+1,GAMMAEI,+1
0188	REF	21	LAST	168	05,2213	77671 1		-1DNADR STATE +10D	FALGWRDS 10 AND 11

R0189 ----------SUB LISTS----------

0190	REF	3	LAST	168	05,2047	CMRENDO1	EQUALS	CMPOWE01	COMMON DOWNLIST DATA
0191	REF	4	LAST	168	05,2056	CMRENDO2	EQUALS	CMPOWE02	COMMON DOWNLIST DATA
0192	REF	4	LAST	168	05,2063	CMRENDO3	EQUALS	CMPOWE03	COMMON DOWNLIST DATA

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0193   REF   3  LAST  168   05,2065          CMRENDO4 EQUALS CMPOWE04        COMMON DOWNLIST DATA
0194   REF   3  LAST  168   05,2067          CMRENDO5 EQUALS CMPOWE05        COMMON DOWNLIST DATA
0195   REF   3  LAST  168   05,2076          CMRENDO6 EQUALS CMPOWE06        COMMON DOWNLIST DATA
0196   REF   3  LAST  168   05,2101          CMRENDO7 EQUALS CMPOWE07        COMMON DOWNLIST DATA
R0197  ----------------------------------------------------------------------
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P0198 CSM ENTRY AND UPDATE DOWNLIST

R0199 ----------CONTROL LIST----------

0200					05,2214		CMENTROL	EQUALS	SEND ID BY SPECIAL CODING
0201	REF	1			05,2214	32047 C		DNPTR CMENTRO1	COLLECT SNAPSHOT
0202	REF	15	LAST	17C	05,2215	24340 C		6DNADR DNTMBUFF	SEND SNAPSHOT
0203	REF	1			05,2216	32056 C		DNPTR CMENTRO2	COLLECT SECOND SNAPSHOT
0204	REF	16	LAST	172	05,2217	14340 C		4DNADR DNTMBUFF	SEND SNAPSHOT
0205	REF	1			05,2220	32063 C		DNPTR CMENTRO3	COMMON DATA
0206	REF	2	LAST	108	05,2221	07300 C		2DNADR CMDAPMOD	CMDAPMOD,PREL,QREL,RREL
0208	REF	2	LAST	115	05,2222	03635 1		1DNADR L/D1	L/D1,+1
0209	REF	3	LAST	7C	05,2223	24304 C		6DNADR UPBUFF	UPBUFF,+1...+10,+11
0210	REF	4	LAST	172	05,2224	14320 C		4DNADR UPBUFF +12D	UPBUFF+12,13...+18,19D
0211	REF	3	LAST	69	05,2225	04300 C		2DNADR COMPNUMB	COMPNUMB,UPCLDMOD,UPVERB,UPCOUNT
0212	REF	2	LAST	108	05,2226	03313 C		1DNADR PAXERR1	PAXERR1,ROLLTM
0213	REF	3	LAST	116	05,2227	13675 1		3DNADR LATANG	LATANG,+1,RDOT,+1,THETAH,+1
0216	REF	3	LAST	17C	05,2230	07400 1		2DNADR LAT(SPL)	LAT(SPL),+1,LNG(SPL),+1
0217	REF	2	LAST	108	05,2231	03265 C		1DNADR ALFA/180	ALFA/180,BETA/180
0218	REF	1			05,2232	32065 C		DNPTR CMENTRO4	COMMON DATA
0219	REF	4	LAST	17C	05,2233	00024 1		1DNADR TIME2	TIME2,TIME1
0220	REF	1			05,2234	32264 C		DNPTR CMENTRO5	COLLECT SNAPSHOT
0221	REF	17	LAST	172	05,2235	24340 C		6DNADR DNTMBUFF	SEND SNAPSHOT
0222	REF	2	LAST	172	05,2236	32056 C		DNPTR CMENTRO2	COLLECT SNAPSHOT
0223	REF	18	LAST	172	05,2237	14340 C		4DNADR DNTMBUFF	SEND SNAPSHOT
0224	REF	3	LAST	167	05,2240	07076 1		2DNADR AK	AK,AK1,AK2,RCSFLAGS
0225	REF	4	LAST	167	05,2241	13167 C		3DNADR ERRORX	ERRORX/Y/Z,THETADX/Y/Z
0226	REF	3	LAST	172	05,2242	07300 C		2DNADR CMDAPMOD	CMDAPMOD,PREL,QREL,RREL
0227	REF	5	LAST	172	05,2243	24304 C		6DNADR UPBUFF	UPBUFF+0,+1...+10,+11D
0228	REF	6	LAST	172	05,2244	14320 C		4DNADR UPBUFF +12D	UPBUFF+12,+13...+18,+19D
0229	REF	3	LAST	167	05,2245	03073 C		1DNADR LEMMASS	LEMMASS,CSMMASS
0230	REF	2	LAST	167	05,2246	03066 1		1DNADR DAPDATR1	DAPDATR1,DAPDATR2
0231	REF	2	LAST	108	05,2247	03314 1		1DNADR ROLLTM	ROLLTM,ROLLC
0232	REF	26	LAST	17C	05,2250	01331 1		1DNADR OPTMODES	OPTMODES,HOLDFLAG
0233	REF	5	LAST	167	05,2251	13125 C		3DNADR WBODY	WBODY,...+5/OMEGAC,...+5
0234	REF	2	LAST	167	05,2252	05154 1		2DNADR REDOCTR	REDOCTR,THETAD+0,+1,+2
0235	REF	33	LAST	167	05,2253	01320 1		1DNADR IMODES30	IMODES30,IMODES33
0236					05,2254	34011 C		DNCHAN 11	CHANNELS 11,12
0237					05,2255	34013 1		DNCHAN 13	CHANNELS 13,14
0238					05,2256	34030 C		DNCHAN 30	CHANNELS 30,31
0239					05,2257	34032 1		DNCHAN 32	CHANNELS 32,33
0240	REF	2	LAST	167	05,2260	01432 C		1DNADR RSBBQ	RSBBQ,+1
0241	REF	2	LAST	167	05,2261	10372 C		3DNADR CADRFLSH	CADRFLSH,+1,+2,FAILREG,+1,+2
0242	REF	22	LAST	17C	05,2262	00106 C		1DNADR STATE +10D	FALGWRDS 10 AND 11
0243	REF	3	LAST	116	05,2263	74007 C		-1DNADR GAMMAEI	GAMMAEI,+1

R0244 ----------SUB LISTS----------

0245	REF	4	LAST	17C	05,2047		CMENTRO1	EQUALS CMPOWE01	COMMON DOWNLIST DATA

L DOWNLINK LISTS USER'S PAGE NO. 9 EO S3

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0246   REF   5  LAST  17C   05,2056             CMENTRO2 EQUALS CMPOWEO2        COMMON DOWNLIST DATA

0247   REF   5  LAST  17C   05,2063             CMENTRO3 EQUALS CMPOWEO3        COMMON DOWNLIST DATA

0248   REF   4  LAST  171   05,2065             CMENTRO4 EQUALS CMPOWEO4        COMMON DOWNLIST DATA

0249   REF   5  LAST  166   05,2264   76615 1   CMENTRO5-1DNADR DELV            DELV,+1          SNAPSHOT DATA
0250   REF   6  LAST  173   05,2265   01164 0            1DNADR DELV +2       DELV+2,+3
0251   REF   7  LAST  173   05,2266   01166 1            1DNADR DELV +4       DELV+4,+5
0252   REF   3  LAST  116   05,2267   03726 1            1DNADR TTE           TTE,+1
0253   REF   3  LAST  116   05,2270   03724 0            1DNADR VIO           VIO,+1
0254   REF   4  LAST  17C   05,2271   03766 0            1DNADR VPRED         VPRED,+1
0255   REF   3  LAST  166   05,2272   76532 1           -1DNADR PIPTIME1      PIPTIME1,+1

0256   REF   4  LAST  171   05,2101             CMENTRO7 EQUALS CMPOWEO7        COMMON DOWNLIST DATA

R0257  ----------------------------------------------------------------------
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P0258 P22 DOWNLISTS

R0259 ----------CONTROL LIST----------

0260					05,2273		CMPG22DL	EQUALS	SEND ID BY SPECIAL CODING
0261	REF	1			05,2273	32047 C		DNPTR CMPG2201	COLLECT SNAPSHOT
0262	REF	19	LAST	172	05,2274	24340 C		6DNADR DNTMBUFF	SEND SNAPSHOT
0263	REF	1			05,2275	32056 C		DNPTR CMPG2202	COLLECT SNAPSHOT
0264	REF	20	LAST	174	05,2276	14340 C		4DNADR DNTMBUFF	SEND SNAPSHOT
0265	REF	1			05,2277	32063 C		DNPTR CMPG2203	COMMON DATA
0266	REF	2	LAST	116	05,2300	27537 C		6DNADR SVMRKDAT	LANDING SITE MARK DATA
0267	REF	3	LAST	174	05,2301	27553 1		6DNADR SVMRKDAT +12D	SVMRKDAT+0...+34
0268	REF	4	LAST	174	05,2302	27567 C		6DNADR SVMRKDAT +24D	LANDING SITE MARK DATA
0269	REF	2	LAST	94	05,2303	02751 C		1DNADR LANDMARK	LANDMARK,GARBAGE
0270	REF	9	LAST	170	05,2304	00007 C		1DNADR SPARE	
0271	REF	10	LAST	174	05,2305	00007 C		1DNADR SPARE	
0272	REF	11	LAST	174	05,2306	00007 C		1DNADR SPARE	
0273	REF	1			05,2307	32065 C		DNPTR CMPG2204	COMMON DATA
0274	REF	5	LAST	172	05,2310	00024 1		1DNADR TIME2	TIME2,TIME1
0275	REF	1			05,2311	32337 1		DNPTR CMPG2205	COLLECT SNAPSHOT
0276	REF	21	LAST	174	05,2312	04340 1		2DNADR DNTMBUFF	SEND SNAPSHOT
0277	REF	12	LAST	174	05,2313	00007 C		1DNADR SPARE	
0278	REF	13	LAST	174	05,2314	00007 C		1DNADR SPARE	
0279	REF	14	LAST	174	05,2315	00007 C		1DNADR SPARE	
0280	REF	15	LAST	174	05,2316	00007 C		1DNADR SPARE	
0281	REF	2	LAST	174	05,2317	32056 C		DNPTR CMPG2202	COLLECT SNAPSHOT
0282	REF	22	LAST	174	05,2320	14340 C		4DNADR DNTMBUFF	SEND SNAPSHOT
0283	REF	2	LAST	174	05,2321	32063 C		DNPTR CMPG2203	COMMON DATA
0284	REF	1			05,2322	32076 1		DNPTR CMPG2206	COMMON DATA
0285	REF	2	LAST	94	05,2323	02747 1		1DNADR 8NN	8NN,GARBAGE
0286	REF	23	LAST	172	05,2324	00106 C		1DNADR STATE +100	FALGWRDS 10 AND 11
0287	REF	1			05,2325	12025 C		3DNADR RLS	RLS,+1,...+4,+5
0288	REF	16	LAST	174	05,2326	00007 C		1DNADR SPARE	
0289	REF	27	LAST	172	05,2327	01331 1		1DNADR OPTMODES	OPTMODES,HOLDFLAG
0290	REF	1			05,2330	32101 C		DNPTR CMPG2207	COMMON DATA
0291	REF	17	LAST	174	05,2331	00007 C		1DNADR SPARE	
0292	REF	18	LAST	174	05,2332	00007 C		1DNADR SPARE	
0293	REF	19	LAST	174	05,2333	00007 C		1DNADR SPARE	
0294	REF	20	LAST	174	05,2334	00007 C		1DNADR SPARE	
0295	REF	21	LAST	174	05,2335	00007 C		1DNADR SPARE	
0296	REF	22	LAST	174	05,2336	77770 1		-1DNADR SPARE	

R0297 ----------SUB LISTS----------

0298	REF	5	LAST	172	05,2047	CMPG2201	EQUALS	CMPOWE01	COMMON DOWNLIST DATA
0299	REF	6	LAST	173	05,2056	CMPG2202	EQUALS	CMPOWE02	COMMON DOWNLIST DATA
0300	REF	6	LAST	173	05,2063	CMPG2203	EQUALS	CMPOWE03	COMMON DOWNLIST DATA

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0301   REF   5  LAST  173   05,2065              CMPG2204 EQUALS CMPOWE04          COMMON DOWNLIST DATA

0302   REF   2  LAST   75   05,2337   76672 C  CMPG2205-1DNADR LONG               LONG,+1                SNAPSHOT DATA
0303   REF   2  LAST   75   05,2340   01107 C          1DNADR ALT                ALT,+1
0304   REF   3  LAST   75   05,2341   76674 C         -1DNADR LAT                LAT,+1

0305   REF   4  LAST  171   05,2076              CMPG2206 EQUALS CMPOWE06          COMMON DOWNLIST DATA

0306   REF   5  LAST  173   05,2101              CMPG2207 EQUALS CMPOWE07          COMMON DOWNLIST DATA

R0307  ----------------------------------------------------------------------

0308   REF   2  LAST  165   05,2342   02113 C  DNTABLE  GENADR CMCSTADL
0309   REF   2  LAST  165   05,2343   02214 1           GENADR CMENTRDL
0310   REF   1              05,2344   02147 1           GENADR CMRENDDL
0311   REF   1              05,2345   02001 1           GENADR CMPOWEDL
0312   REF   1              05,2346   02273 C           GENADR CMPG22DL

R0313  ----------------------------------------------------------------------
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P00001 PROGRAM DESCRIPTION 8 APRIL, 1967
R0001 SUNDISK REV 120
R0002 FUNCTIONAL DESCRIPTION

R0003 SLAP1 MAN INITIATED FRESH START
R0004 1. EXECUTE STARTSUB
R0005 2. TURN OFF DSKY DISCRETE-LAMPS
R0006 3. CLEAR FAIL REGISTERS,SELF CHECK ERROR COUNTER AND RESTART
R0007 COUNTER
R0008 4. EXECUTE DOFSTART

R0009 DOFSTART MACHINE INITIATED FRESH START

R0010 1. CLEAR SELF-CHECK REGISTERS, MODE REGISTER AND COUZ REGISTER
R0011 2. CLEAR PHASE TABLE
R0012 3. INITIALIZE IMU FLAGS
R0013 4. INITIALIZE FLAGWORDS
R0014 5. TRANSFER CONTROL TO IDLE LOOP IN DUMMYJOB

R0015 GOPROG HARDWARE RESTART

R0016 0. EXECUTE STARTSUB
R0017 1. TRANSFER CONTROL TO DOFSTART IF ANY OF THE FOLLOWING CONDITIONS
R0018 EXIST.
R0019 A. RESTART OCCURED DURING EXECUTION OF ERASCHK
R0020 B. BOTH OSCILLATOR FAIL AND AGC WARNING ARE ON
R0021 C. MARK REJECT AND EITHER NAV OR MAIN DSKY ERROR LIGHT RESET
R0022 ARE ON.
R0023 2. SCHEDULE A T5RUPT PROGRAM FOR THE DAP
R0024 3. SET FLAGWRD5 BITS FOR INTWAKE ROUTINE
R0025 4. EXTINGUISH ALL DSKY LAMPS, EXCEPT PROGRAM ALARM,GIMBAL LOCK AND
R0026 NO ATT
R0027 5. INITIALIZE IMU FLAGS
R0028 6. IF ENGINE COMMAND IS ON (FLAGWRD5,BIT 7), SET ENGINE ON (CHAN-
R0029 NEL 11, BIT 13)
R0030 7. TRANSFER CONTROL TO GOPROG3

R0031 ENEMA SOFTWARE RESTART INITIATED BY MAJOR MODE CHANGE

R0032 1. EXECUTE STARTSB2
R0033 2. KILL PROGRAMS THAT WERE INTEGRATING OR WAITING FOR INTEGRATION
R0034 ROUTINE
R0035 3. TRANSFER CONTROL TO GOPROG3

R0036 GOPROG3 SUBROUTINE COMMON TO GOPROG AND ENEMA

R0037 1. TEST PHASE TABLES - IF INCORRECT, DISPLAY ALARM 1107 AND
R0038 TRANSFER CONTROL TO DOFSTART
R0039 2. DISPLAY MAJOR MODE
R0040 3. IF ANY GROUPS WERE ACTIVE UPON RESTART,TRANSFER CONTROL TO THE

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R0041              RESTARTS SUBROUTINE TO RESCHEDULE PENDING TASKS, LONGCALLS, AND
R0042              JOBS (P20 IS RESTARTED VIA FINDVAC)
R0043           4. IF NO GROUPS WERE ACTIVE UPON RESTART, DISPLAY ALARM CODE
R0044              1110 (RESTART WITH NO ACTIVE GROUPS).
R0045           5. TRANSFER CONTROL TO IDLE LOOP IN DUMMYJOB

R0046         STARTSUB    SUBROUTINE COMMON TO SLAP1 AND GOPROG

R0047           1. CLEAR OUTBIT CHANNELS 5 AND 6
R0048           2. INITIALIZE TIME5,TIME4,TIME3
R0049           3. TRANSFER CONTROL TO STARTSB2

R0050         STARTSB2    SUBROUTINE COMMON TO STARTSUB AND ENEMA

R0051           1. INITIALIZE OUTBIT CHANNELS 11,12,13 AND 14
R0052           2. REPLACE ALL TASKS ON WAITLIST WITH ENDTASK
R0053           3. MAKE ALL EXECUTIVE REGISTERS AVAILABLE
R0054           4. MAKE ALL VAC AREAS AVAILABLE
R0055           5. CLEAR DSKY REGISTERS
R0056           6. ZERO NUMEROUS SWITCHES
R0057           7. INITIALIZE OPTICS FLAGS
R0058           8. INITIALIZE PIPA AND TELEMETRY FAIL FLAGS
R0059           9. INITIALIZE DOWN TELEMETRY

R0060    INPUT/OUTPUT INITIALIZATION

R0061         A. CALLING SEQUENCE

R0062              SLAP1 -  TC    POSTJUMP    OR    VERB 36,ENTER
R0063                       CADR SLAP1

R0064              ENEMA -  TC    POSTJUMP     ***  DO NOT CALL ENEMA WITHOUT  ***
R0065                       CADR ENEMA         ***  CONSULTING POOH PEOPLE     ***

R0066         B. OUTPUT

R0067              ERASABLE MEMORY INITIALIZATION

R0068    PROGRAM ANALYSIS

R0069         A. SUBROUTINES CALLED

R0070              MR.KLEAN,WAITLIST,DSPMM,ALARM,RESTARTS,FINDVAC

R0071         B. ALARMS

R0072              1107  PHASE TABLE ERROR
R0073              1110  RESTART WITH NO ACTIVE GROUPS
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0074                          10,2203                    BANK   10
0075   REF   1                05,2000                    SETLOC FRANDRES
0076                          05,2347                    BANK

0077   REF   3  LAST  127     E3,1400                    EBANK= LST1

0078   REF   1                                          COUNT  05/START

0079                          05,2347  0 0004 0  SLAP1    INHINT                 FRESH START. COMES HERE FROM PINBALL.
0080   REF   1                05,2350  0 2750 1          TC     STARTSUB        SUBROUTINE DOES MOST OF THE WORK.

0081   REF   1                05,2351  1 2356 1  STARTSW  TCF    SKIPSIM         PATCH....TCF STARTSIM...FOR SIMULATION
0082   REF  19  LAST  145     05,2352  3 4675 1  STARTSIM CAF    BIT14
0083   REF   1                05,2353  0 5042 1          TC     FINDVAC
0084                          05,2354   77777 0  SIM2CADR OCT    77777           PATCH 2CADR (AND EBANK DESIGNATION) OF
0085                          05,2355   77777 0           OCT    77777           SIMULATION START ADDRESS.

0086   REF  17  LAST  162     05,2356  3 4674 0  SKIPSIM  CAF    BIT15           TURN OFF ALL DSPTAB+11D LAMPS ONLY ON
0087   REF  19  LAST  168     05,2357  55'036 1          TS     DSPTAB +11D     REQUESTED FRESH START.

0088   REF  10  LAST  161     05,2360  3 4714 1          CAF    ZERO            SAME STORY ON ZEROING FAILREG.
0089   REF   2  LAST   79     05,2361  55'365 1          TS     ERCOUNT
0092   REF   1                05,2362  54 375 1          TS     FAILREG
0093   REF   2  LAST  178     05,2363  54 376 1          TS     FAILREG +1
0094   REF   3  LAST  178     05,2364  54 377 0          TS     FAILREG +2
0096   REF   3  LAST  172     05,2365  55'154 1          TS     REDOCTR

0100   REF   1                05,2366  4 4603 1          CS     PRIO12
0101   REF  10  LAST  133     05,2367  55'302 0          TS     DSRUPTSW

0102   REF  11  LAST  178     05,2370  3 4714 1  DOFSTART CAF    ZERO            DO A FRESH START.
0103   REF   2  LAST   79     05,2371  55'360 1          TS     ERESTORE        ***** MUST NOT BE REMOVED FROM DOFSTART
0104   REF   2  LAST   79     05,2372  55'362 0          TS     SMODE           ***** MUST NOT BE REMOVED FROM DOFSTART
01045  REF   2  LAST   82     05,2373  55'501 0          TS     UPSVFLAG        UPDATE STATE VECTOR REQUEST FLAGWORD
01046                         05,2374  0 0006 1          EXTEND
01047  REF   1                05,2375  01 005 0          WRITE  CHAN5           TURN OFF RCS JETS
01048                         05,2376  0 0006 1          EXTEND
01049  REF   1                05,2377  01 006 0          WRITE  CHAN6           TURN OFF RCS JETS
0105                          05,2400  0 0006 1          EXTEND
0106   REF   6  LAST  153     05,2401  01 011 0          WRITE  DSALMOUT        ZERO CHANNEL 11
0107                          05,2402  0 0006 1          EXTEND
0108   REF  18  LAST  164     05,2403  01 012 0          WRITE  CHAN12          ZERO CHANNEL 12
0109                          05,2404  0 0006 1          EXTEND
0110   REF   1                05,2405  01 013 1          WRITE  CHAN13          ZERO CHANNEL 13
0111                          05,2406  0 0006 1          EXTEND
0112   REF   4  LAST  164     05,2407  01 014 0          WRITE  CHAN14          ZERO CHANNEL 14
0114   REF   7  LAST  159     05,2410  55'316 0          TS     WTOPTION
0116   REF   2  LAST   70     05,2411  54 332 1          TS     DNLSTCOD

0117   REF   1                05,2412  54 371 0          TS     NVSAVE
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0118   REF   1              05,2413  55'071 1     TS      EBANKTEM
0120   REF   1              05,2414  55'130 C     TS      RATEINDX
01201  REF   2  LAST   75   05,2415  55'126 1     TS      TRKMKCNT
01202  REF   2  LAST  17C   05,2416  55'125 1     TS      VHFCNT
01203  REF   1              05,2417  55'044 1     TS      EXTVBACT

0121   REF   1              05,2420  0 2465 1     TC      MR.KLEAN

01215  REF  12  LAST  178   05,2421  4 4714 C     CS      ZERO
01216  REF   1              05,2422  55'011 1     TS      MODREG

01217  REF   1              05,2423  3 4371 C     CAF     PRIO30
01218  REF   1              05,2424  54 366 C     TS      RESTREG

0122   REF   1              05,2425  3 3156 C     CAF     IM30INIF        FRESH START IMU INITIALIZATION.
0123   REF  34  LAST  172   05,2426  55'320 C     TS      IMODES30

0124   REF   7  LAST  14S   05,2427  0 4633 C     TC      IBNKCALL        IN CASE RESTART CALLS DOFSTART
0125   REF   3  LAST  13S   05,2430   17070 C     CADR    NOATTOFF

0126   REF   3  LAST  15E   05,2431  3 7716 C     CAF     NEGONE
0127   REF  15  LAST  164   05,2432  55'303 1     TS      OPTIND          KILL COARSE OPTICS

0128   REF   1              05,2433  3 3161 1     CAF     OPTINITF
0129   REF  28  LAST  174   05,2434  55'331 C     TS      OPTMODES

0130   REF   1              05,2435  3 4763 1     CAF     IM33INIT
0131   REF  17  LAST  16C   05,2436  55'321 1     TS      IMODES33

0132                        05,2437  0 0006 1     EXTEND          LET T5 IDLE.
0133   REF   1              05,2440  3 3135 C     DCA     T5IDLER
0134   REF   2  LAST  127   05,2441  53'313 C     DXCH    T5LOC

0135                        05,2442  0 0006 1     EXTEND          INITIALIZE SWITCHES ONLY ON FRESH START.
0136   REF   1              05,2443  3 3164 1     DCA     SWINIT
0137   REF  24  LAST  174   05,2444  52 075 1     DXCH    STATE
0139                        05,2445  0 0006 1     EXTEND
0140   REF   2  LAST  17S   05,2446  3 3166 C     DCA     SWINIT +2
01405  REF  25  LAST  17S   05,2447  52 077 C     DXCH    STATE +2
0141                        05,2450  0 0006 1     EXTEND
0142   REF   3  LAST  17S   05,2451  3 3170 1     DCA     SWINIT +4
0143   REF  26  LAST  17S   05,2452  52 101 C     DXCH    STATE +4
0144                        05,2453  0 0006 1     EXTEND
0145   REF   4  LAST  17S   05,2454  3 3172 C     DCA     SWINIT +6
0146   REF  27  LAST  17S   05,2455  52 103 1     DXCH    STATE +6
01462                       05,2456  0 0006 1     EXTEND
01464  REF   5  LAST  17S   05,2457  3 3174 C     DCA     SWINIT +8D
01466  REF  28  LAST  17S   05,2460  52 105 1     DXCH    STATE +8D

0147   REF   6  LAST  17S   05,2461  3 3175 1     CA      SWINIT +10D
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0148   REF  29  LAST  179   05,2462  54 106 1            TS      STATE +100
0155   REF   2  LAST  138   05,2463  0 4574 C  ENDRSTRT TC      POSTJUMP
0156   REF   1              05,2464   03225 1            CADR    DUMMYJOB + 2    DOES A RELINT.  (IN A SWITCHED BANK.)

0157                        05,2465  0 0004 C  MR.KLEAN INHINT
01571                       05,2466  0 0006 1            EXTEND
0158   REF   3  LAST  163   05,2467  3 4714 1            DCA     NEGO
0159   REF   1              05,2470  52 755 1            DXCH    -PHASE2
0160                        05,2471  0 0006 1  POOKLEAN EXTEND
0161   REF   4  LAST  18C   05,2472  3 4714 1            DCA     NEGO
0162   REF   1              05,2473  52 761 C            DXCH    -PHASE4
0163                        05,2474  0 0006 1            EXTEND
0164   REF   5  LAST  18C   05,2475  3 4714 1            DCA     NEGO
0165   REF   1              05,2476  52 753 1            DXCH    -PHASE1
0166                        05,2477  0 0006 1  V37KLEAN EXTEND
0167   REF   6  LAST  18C   05,2500  3 4714 1            DCA     NEGO
0168   REF   1              05,2501  52 757 C            DXCH    -PHASE3
0169                        05,2502  0 0006 1            EXTEND
0170   REF   7  LAST  18C   05,2503  3 4714 1            DCA     NEGO
0171   REF   1              05,2504  52 763 1            DXCH    -PHASE5
0172                        05,2505  0 0006 1            EXTEND
0173   REF   8  LAST  18C   05,2506  3 4714 1            DCA     NEGO
0174   REF   1              05,2507  52 765 1            DXCH    -PHASE6
0175   REF  15  LAST  163   05,2510  0 0002 C            TC      Q
```

L FRESH START AND RESTART USER'S PAGE NO. 6 E3 S3

```
P0177            COMES HERE FROM LOCATION 4000, GOJAM. RESTART ANY PROGRAMS WHICH MAY HAVE BEEN RUNNING AT THE TIME.

 0179  REF  4 LAST 178   05,2511  25'154 C  GOPROG   INCR    REDOCTR          ADVANCE RESTART COUNTER.

 0180  REF 16 LAST 18C   05,2512  22 002 C            LXCH    Q
 01805                   05,2513  0 0006 1            EXTEND
 01806 REF  1            05,2514  04 007 1            ROR     SUPERBNK
 0181  REF  3 LAST 172   05,2515  53'433 C            DXCH    RSBBQ
 0182  REF  2 LAST 178   05,2516  0 2750 1            TC      STARTSUB

R0183                                                ERASCHK TEMPORARILY STORES THE CONTENTS OF TWO ERASABLE LOCATIONS, X
R0185                                                AND X+1 INTO SKEEP5 AND SKEEP6. IT ALSO STORES X INTO SKEEP7 AND
R0187                                                ERESTORE. IF ERASCHK IS INTERRUPTED BY A RESTART, C(ERESTORE) SHOULD
R0189                                                EQUAL C(SKEEP7),AND BE A + NUMBER LESS THAN 2000 OCT. OTHERWISE
R0191                                                C(ERESTORE) SHOULD EQUAL +0.

 0192  REF  2 LAST 13C   05,2517  3 4364 1            CAF     HI5
 0193  REF  3 LAST 178   05,2520  7 1360 1            MASK    ERESTORE
 0194                   05,2521  0 0006 1            EXTEND
 0195                   05,2522  1 2524 1            BZF     +2               IF ERESTORE NOT = +0 OR +N LESS THAN 2K,
 0196  REF  1            05,2523  1 2370 C            TCF     DOFSTART         DOUBT E MEMORY AND DO A FRESH START.
 0197  REF  4 LAST 181   05,2524  4 1360 1            CS      ERESTORE
 0198                   05,2525  0 0006 1            EXTEND
 0199  REF  1            05,2526  1 2543 C            BZF     DORSTART         = +0 CONTINUE WITH RESTART.
 0200  REF  1            05,2527  6 1377 C            AD      SKEEP7
 0201                   05,2530  0 0006 1            EXTEND
 0202                   05,2531  1 2533 1            BZF     +2               = SKEEP7, RESTORE E MEMORY.
 0203  REF  2 LAST 181   05,2532  1 2370 C            TCF     DOFSTART         NOT= SKEEP7, DOUBE E MEM,DO FRESH START.
 0204  REF  2 LAST  79   05,2533  3 1374 C            CA      SKEEP4
 0205  REF  1            05,2534  54 003 C            TS      EBANK            EBANK OF E MEMORY THAT WAS UNDER TEST.
 0206                   05,2535  0 0006 1            EXTEND                   (NOT DXCH SINCE THIS MIGHT HAPPEN AGAIN)
 0207  REF  2 LAST  79   05,2536  3 1376 1            DCA     SKEEP5
 0208  REF  2 LAST 181   05,2537  51'377 C            INDEX   SKEEP7
 0209                   05,2540  52 001 1            DXCH    0000             E MEMORY RESTORED.
 0210  REF 13 LAST 179   05,2541  3 4714 1            CA      ZERO
 0211  REF  5 LAST 181   05,2542  55'360 1            TS      ERESTORE
 0212  REF 18 LAST 178   05,2543  3 4674 C  DORSTART  CA      BIT15            TEST OSC FAIL BIT TO SEE IF WE HAVE
 0213                   05,2544  0 0006 1            EXTEND                   HAD A POWER TRANSIENT.  IF SO, ATTEMPT
 0214  REF  3 LAST 159   05,2545  03 033 1            WAND    CHAN33           A RESTART.  IF NOT, CHACK THE PRESENT
 0215                   05,2546  0 0006 1            EXTEND                   STATE OF AGC WARNING.
 0216  REF  1            05,2547  1 2555 1            BZF     BUTTONS

 0217  REF 20 LAST 178   05,2550  3 4675 1            CA      BIT14            IF AGC WARNING ON (BIT = 0), DO A FRESH
 0218                   05,2551  0 0006 1            EXTEND                   START ON THE ASSUMPTION THAT WE'RE IN A
 0219  REF  4 LAST 181   05,2552  02 033 C            RAND    CHAN33           RESTART LOOP.
 0220                   05,2553  0 0006 1            EXTEND
 0221  REF  3 LAST 181   05,2554  1 2370 C            BZF     DOFSTART

 0222  REF  1            05,2555  0 2725 C  BUTTONS  TC      LIGHTSET         EXIT
A0223                                                MARK REJECT DEPRESSED SIMULTANEOUSLY
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0238   REF   1                  05,2556  3 0102 1  ELRSKIP  CA      FLAGWRD6      RESTART AUTOPILOTS
0239                            05,2557  0 0006 1           EXTEND
0240   REF  12  LAST  156       05,2560  7 4710 1           MP      BIT3          BITS 15,14 00 T5IDLOC
0241   REF   4  LAST  159       05,2561  7 6211 1           MASK    SIX                      01 REDORCS
0242                            05,2562  0 0006 1           EXTEND                   10 REDOTVC
0243   REF  38  LAST  163       05,2563  5 0000 1           INDEX   A                11 REDOSAT
0244   REF   2  LAST  179       05,2564  3 3135 C           DCA     T5IDLER
0245   REF   3  LAST  179       05,2565  53'313 C           DXCH    T5LOC

0246   REF   1                  05,2566  4 4675 C           CS      INTFLBIT
0247   REF   1                  05,2567  7 0106 1           MASK    RASFLAG
0248   REF   2  LAST  182       05,2570  54 106 1           TS      RASFLAG

0256   REF  29  LAST  179       05,2571  3 1331 1           CA      OPTMODES
0257   REF   1                  05,2572  7 3162 C           MASK    OPTINITR
0258   REF  17  LAST  160       05,2573  6 4704 C           AD      BIT7
0259   REF  30  LAST  182       05,2574  55'331 C           TS      OPTMODES

0260   REF  20  LAST  160       05,2575  3 4705 1           CAF     BIT6
0261   REF  18  LAST  179       05,2576  7 1321 1           MASK    IMODES33
0262   REF   2  LAST  179       05,2577  6 4763 1           AD      IM33INIT
0263   REF  19  LAST  182       05,2600  55'321 1           TS      IMODES33

0264   REF   1                  05,2601  3 3160 C           CA      9,6,4         LEAVE PROG ALARM,GIMBAL LOCK, NO ATT
0265   REF  20  LAST  178       05,2602  7 1036 1           MASK    DSPTAB +11D   LAMPS INTACT ON HARDWARE RESTART
0266   REF  19  LAST  181       05,2603  6 4674 C           AD      BIT15
0267   REF  21  LAST  182       05,2604  57'036 C           XCH     DSPTAB +11D
0268   REF  15  LAST  144       05,2605  7 4707 1           MASK    BIT4          IF NO ATT LAMP WAS ON, LEAVE ISS IN
0269                            05,2606  0 0006 1           EXTEND                COURSE ALIGN
0270   REF   1                  05,2607  1 2616 C           BZF     NOCOARSE
0271   REF   8  LAST  179       05,2610  0 4633 C           TC      IBNKCALL      IF NO ATT LAMP ON, RETURN ISS TO
0272   REF   2  LAST  142       05,2611    16746 C          CADR    SETCOARS          COARSE ALIGN

02721  REF   5  LAST  182       05,2612  3 6211 C           CAF     SIX
02722  REF   6  LAST  158       05,2613  0 5140 1           TC      WAITLIST
02723  REF   4  LAST  143       E3,1474                     EBANK=  CDUIND
02724  REF   2  LAST  143       05,2614    02742 1          2CADR   CA+ECE
02724                            05,2615    16063 C
0273   REF   1                  05,2616  3 3144 C  NOCOARSE CAF     IFAILINH      LEAVE FAILURE INHIBITS INTACT ON
0274   REF  35  LAST  179       05,2617  7 1320 C           MASK    IMODES30          HARDWARE RESTART. RESET ALL
0275   REF   1                  05,2620  6 3157 1           AD      IM30INIR          FAILURE CODES.
0276   REF  36  LAST  182       05,2621  55'320 C           TS      IMODES30

0277   REF   2  LAST  130       05,2622  4 0101 C           CS      FLAGWRD5
0278   REF  18  LAST  182       05,2623  7 4704 1           MASK    BIT7
0279   REF  39  LAST  182       05,2624  10 000 C           CCS     A
0280   REF   1                  05,2625  1 2640 C           TCF     GOPROG3
0281   REF  14  LAST  162       05,2626  3 4676 1           CAF     BIT13
0282                            05,2627  0 0006 1           EXTEND
0283   REF   7  LAST  178       05,2630  05 011 1           WOR     DSALMOUT      TURN ENGINE ON
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0284   REF   2  LAST  182   05,2631  1 2640 C          TCF     GOPROG3
0285                        05,2632  0 0004 C  ENEMA    INHINT
02850  REF   2  LAST  181   05,2633  0 2725 C          TC      LIGHTSET        EXIT TO GOFSTART IF ERROR RESET AND
02851  REF   1               05,2634  0 2760 1          TC      STARTSB2        MARK REJECT DEPRESSED SIMULTANEOUSLY
0289   REF   1               05,2635  4 3151 C          CS      INTMASK         RESET INTEGRATION BITS
02891  REF   3  LAST  182   05,2636  7 0106 1          MASK    RASFLAG
0290   REF   4  LAST  183   05,2637  54 106 1          TS      RASFLAG

0291   REF   1               05,2640  3 4715 C  GOPROG3  CAF     NUMGRPS         VERIFY PHASE TABLE AGREEMENTS
0292   REF   1               05,2641  54 161 C  PCLOOP   TS      MPAC +5
0293                        05,2642  6 0000 1          DOUBLE
0294                        05,2643  0 0006 1          EXTEND
0295   REF  40  LAST  182   05,2644  5 0000 1          INDEX   A
0296   REF   2  LAST  180   05,2645  3 0753 C          DCA     -PHASE1         COMPLEMENT INTO A, DIRECT INTO L.
0297                        05,2646  0 0006 1          EXTEND
0298   REF   9  LAST  162   05,2647  06 001 C          RXOR    LCHAN           RESULT MUST BE -0 FOR AGREEMENT.
0299   REF  41  LAST  183   05,2650  10 000 C          CCS     A
0300   REF   1               05,2651  1 2720 1          TCF     PTBAD           RESTART FAILURE.
0301   REF   2  LAST  183   05,2652  1 2720 1          TCF     PTBAD
0302   REF   3  LAST  183   05,2653  1 2720 1          TCF     PTBAD

0303   REF   2  LAST  183   05,2654  10 161 C          CCS     MPAC +5         PROCESS ALL RESTART GROUPS.
0304   REF   1               05,2655  1 2641 1          TCF     PCLOOP
0305   REF   3  LAST  183   05,2656  54 162 C          TS      MPAC +6         SET TO +0.
0306   REF   1               05,2657  0 5247 C          TC      MMDSPLAY        DISPLAY MAJOR MODE

0307                        05,2660  0 0004 C          INHINT                  RELINT DONE IN MMDSPLAY

03071  REF   2  LAST  182   05,2661  30 102 1          CAE     FLAGWRD6        IS RCS DAP RUNNING (BITS 15 14 OF
030715 REF   1               05,2662  7 4105 C          MASK    OCT60000        FLAGWRD6 = 01)
03072                       05,2663  0 0006 1          EXTEND                  YES, DO STOPRATE
030725 REF   1               05,2664  6 2673 1          BZMF    NXTRST -1       NO, SKIP TO NXTRST -1
03073  REF   1               05,2665  3 4752 C          CAF     EBANK6          STOPRATE IS DONE IN EBANK 6
03074  REF   2  LAST  181   05,2666  54 003 C          TS      EBANK
03075  REF   9  LAST  182   05,2667  0 4633 C          TC      IBNKCALL        ZERO DELCOUS, WBODYS, AND BIASES THUS
03076  REF   1               05,2670   45245 C         CADR    STOPRATE        STOPING AUTOMATIC MANEUVERING
03077  REF   1               05,2671  3 4744 1          CAF     EBANK3
03078  REF   3  LAST  183   05,2672  54 003 C          TS      EBANK
0308   REF   2  LAST  183   05,2673  3 4715 C          CAF     NUMGRPS         SEE IF ANY GROUPS RUNNING.
0309   REF   4  LAST  183   05,2674  54 161 C  NXTRST   TS      MPAC +5
0310                        05,2675  6 0000 1          DOUBLE
0311   REF  42  LAST  183   05,2676  50 000 1          INDEX   A
0312   REF   1               05,2677  10 753 1          CCS     PHASE1
0313   REF   1               05,2700  1 2702 1          TCF     PACTIVE         PNZ - GROUP ACTIVE.
0314   REF   1               05,2701  1 2707 1          TCF     PINACT          +0 - GROUP NOT RUNNING.

0315   REF   5  LAST  183   05,2702  54 154 C  PACTIVE  TS      MPAC
0316   REF   6  LAST  183   05,2703  24 154 1          INCR    MPAC            ABS OF PHASE.
0317   REF   7  LAST  183   05,2704  24 162 1          INCR    MPAC +6         INDICATE GROUP DEMANDS PRESENT.
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L FRESH START AND RESTART USER'S PAGE NO. 9 E3 S3

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 0318   REF   1                 05,2705  3 2724 1           CA     RACTCADR
 0319   REF   1                 05,2706  0 4561 1           TC     SWCALL          MUST RETURN TC SWRETURN.

 0320   REF   8  LAST  183      05,2707  10 161 0  PINACT   CCS    MPAC +5         PROCESS ALL RESTART GROUPS.
 0321   REF   2  LAST  183      05,2710  1 2674 1           TCF    NXTRST

 0326   REF   9  LAST  184      05,2711  10 162 0           CCS    MPAC +6         NO, CHECK PHASE ACTIVITY FLAG
 0327   REF   1                 05,2712  1 2463 0           TCF    ENDRSTRT        PHASE ACTIVE
 0328   REF  20  LAST  182      05,2713  3 4674 0           CAF    BIT15           IS MODE -0
 0329   REF   2  LAST  179      05,2714  7 1011 1           MASK   MODREG
 03291                          05,2715  0 0006 1           EXTEND
 03292  REF   1                 05,2716  1 4106 0           BZF    GOTOPOOH        NO
 03293  REF   2  LAST  184      05,2717  1 2463 0           TCF    ENDRSTRT        YES
 0336   REF  10  LAST  161      05,2720  0 5537 0  PTBAD    TC     ALARM           SET ALARM TC SHOW PHASE TABLE FAILURE.
 0337                           05,2721   01107 0           OCT    1107

 0338   REF   4  LAST  181      05,2722  1 2370 0           TCF    DOFSTART        IN R2).

R0339   ******** ****** ******
R0340
R0341   DO NOT USE GOPROG2 OR ENEMA WITHOUT CONSULTING POOH PEOPLE
R0342
 0343   REF   1                 05,2632                     GOPROG2  EQUALS ENEMA
 0344   REF  15  LAST  182        4676                     OCT10000 =      BIT13
 0345   REF   2  LAST  179        4371                     OCT30000 =      PRIO30
 0346                          05,2723   07777 1  OCT7777  OCT    7777
 0347   REF   1                 05,2724   03520 0  RACTCADR CADR   RESTARTS
 0348   REF  19  LAST  182      05,2725  3 4704 0  LIGHTSET CAF    BIT7            DOFSTART IF MARK REJECT AND EITHER
 0349                           05,2726  0 0006 1           EXTEND                  ERROR LIGHT RESET BUTTONS ARE DEPRESSED
 0350   REF   1                 05,2727  02 016 1           RAND   NAVKEYIN
 0351                           05,2730  0 0006 1           EXTEND
 0352   REF   1                 05,2731  1 2745 1           BZF    NONAVKEY        NO MARK REJECT
 0353   REF   1                 05,2732  3 4362 1           CAF    OCT37
 0354                           05,2733  0 0006 1           EXTEND
 0355   REF   2  LAST  184      05,2734  02 016 1           RAND   NAVKEYIN        NAV OSKY KEYCODES,MARK,MARK REJECT
 0356   REF   1                 05,2735  6 3155 0           AD     -ELR
 0357                           05,2736  0 0006 1           EXTEND
 0358   REF   2  LAST  184      05,2737  1 2746 1           BZF    NONAVKEY +1
 0359                           05,2740  0 0006 1           EXTEND
 0360   REF   1                 05,2741  00 015 0           READ   MNKEYIN         MAIN OSKY KEYCODES
 0361   REF   2  LAST  184      05,2742  6 3155 0           AD     -ELR
 0362                           05,2743  0 0006 1           EXTEND
 0363                           05,2744  1 2746 1           BZF    +2

 0364   REF  17  LAST  181      05,2745  0 0002 0  NONAVKEY TC     Q

 0365   REF   3  LAST  181      05,2746  0 2750 1           TC     STARTSUB
 0366   REF   5  LAST  184      05,2747  1 2370 0           TCF    DOFSTART
 0367   REF   1                 05,2750  3 3145 1  STARTSUB CAF    LDNPHAS1        SET POINTER SO NEXT 20MS DOWNRUPT WILL
 0368   REF   1                 05,2751  54 335 0           TS     DNTMGOTO        CAUSE THE CURRENT DOWNLIST TO BE
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A0369                                                                  INTERRUPTED AND START SENDING FROM THE
A0370                                                                  BEGINNING OF THE CURRENT DOWNLIST.

 0371   REF   5  LAST  163   05,2752  3 4672 C          CA     POSMAX
 0372   REF   1              05,2753  54 026 1          TS     TIME3      37777 TO TIME3.
 0373   REF   1              05,2754  6 7715 C          AD     MINUS2
 0374   REF   4  LAST  132   05,2755  54 027 C          TS     TIME4      37775 TO TIME4.
 0375   REF   4  LAST  179   05,2756  6 7716 C          AD     NEGONE
 0376   REF   2  LAST  126   05,2757  54 030 C          TS     TIME5      37774 TO TIME5.

 0377   REF  22  LAST  160   05,2760  3 4712 1  STARTSB2 CAF    BIT1       DURING SOFTWARE RESTART, DO NOT DISTURB
 0378                        05,2761  0 0006 1          EXTEND             ISS WARNING
 0379   REF   8  LAST  182   05,2762  03 011 1          WAND   DSALMOUT

 0380   REF   1              05,2763  3 3152 1          CAF    OCT70      DURING SOFTWARE RESTART, DO NOT DISTURB
 0381                        05,2764  0 0006 1          EXTEND             IMU FLAGS. (COURSE ALIGN ENABLE, ZERO
 0382   REF  19  LAST  178   05,2765  03 012 1          WAND   CHAN12     IMU CDUS. ENABLE IMU ERROR COUNTER)

 0383   REF   1              05,2766  3 3153 C          CAF    OCT74160   DURING SOFTWARE RESTART, DO NOT DUSTURB
 0384                        05,2767  0 0006 1          EXTEND             TELEMETRY FLAGS, RESET TRAP FLAGS, AND
 0385   REF   2  LAST  178   05,2770  03 013 C          WAND   CHAN13     ENABLE T6RUPT FLAG.

 0386   REF  21  LAST  182   05,2771  3 4705 1          CAF    BIT6       DURING SOFTWARE RESTART, DO NOT DISTURB
 0387                        05,2772  0 0006 1          EXTEND             GYRO ENABLE FLAG.
 0388   REF   5  LAST  178   05,2773  03 014 1          WAND   CHAN14

 03881  REF  21  LAST  181   05,2774  4 4675 C          CS     BIT14      CLEAR R21MARK
 03882  REF   1              05,2775  7 0076 1          MASK   FLAGWRD2   R21 SETS R21MARK AND RESETS IT IF R21
 03883  REF   2  LAST  185   05,2776  54 076 1          TS     FLAGWRD2   IS TERMINATED NORMALLY
 0389   REF   4  LAST  178   E3,1400                    EBANK= LST1
 0390   REF   1              05,2777  3 3154 1          CAF    STARTEB
 0391   REF   4  LAST  183   05,3000  54 003 C          TS     EBANK      SET FOR E3

 0392   REF   3  LAST  162   05,3001  3 4673 1          CAF    NEG1/2     INITIALIZE WAITLIST DELTA-TS.
 0393   REF   5  LAST  185   05,3002  55'407 1          TS     LST1 +7
 0394   REF   6  LAST  185   05,3003  55'406 C          TS     LST1 +6
 0395   REF   7  LAST  185   05,3004  55'405 C          TS     LST1 +5
 0396   REF   8  LAST  185   05,3005  55'404 1          TS     LST1  +4
 0397   REF   9  LAST  185   05,3006  55'403 C          TS     LST1  +3
 0398   REF  10  LAST  185   05,3007  55'402 1          TS     LST1  +2
 0399   REF  11  LAST  185   05,3010  55'401 1          TS     LST1  +1
 0400   REF  12  LAST  185   05,3011  55'400 C          TS     LST1

 0401   REF   1              05,3012  4 5173 C          CS     ENDTASK
 0402   REF   1              05,3013  55'410 1          TS     LST2
 0403   REF   2  LAST  185   05,3014  55'412 C          TS     LST2 +2
 0404   REF   3  LAST  185   05,3015  55'414 C          TS     LST2 +4
 0405   REF   4  LAST  185   05,3016  55'416 1          TS     LST2 +6
 0406   REF   5  LAST  185   05,3017  55'420 1          TS     LST2 +8D
 0407   REF   6  LAST  185   05,3020  55'422 C          TS     LST2 +10D
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0408   REF   7  LAST  185   05,3021  55'424 0          TS     LST2 +12D
0409   REF   8  LAST  186   05,3022  55'426 1          TS     LST2 +14D
0410   REF   9  LAST  186   05,3023  55'430 0          TS     LST2 +16D
0411   REF   2  LAST  185   05,3024  4 5174 1          CS     ENDTASK +1
0412   REF  10  LAST  186   05,3025  55'411 0          TS     LST2 +1
0413   REF  11  LAST  186   05,3026  55'413 1          TS     LST2 +3
0414   REF  12  LAST  186   05,3027  55'415 1          TS     LST2 +5
0415   REF  13  LAST  186   05,3030  55'417 0          TS     LST2 +7
0416   REF  14  LAST  186   05,3031  55'421 0          TS     LST2 +9D
0417   REF  15  LAST  186   05,3032  55'423 1          TS     LST2 +11D
0418   REF  16  LAST  186   05,3033  55'425 1          TS     LST2 +13D
0419   REF  17  LAST  186   05,3034  55'427 0          TS     LST2 +15D
0420   REF  18  LAST  186   05,3035  55'431 1          TS     LST2 +17D

0421   REF  14  LAST  181   05,3036  4 4714 0          CS     ZERO          MAKE ALL EXECUTIVE REGISTER SETS
0422   REF   1               05,3037  54 167 0          TS     PRIORITY      AVAILABLE.
0423   REF   2  LAST  186   05,3040  54 203 1          TS     PRIORITY +12D
0424   REF   3  LAST  186   05,3041  54 217 1          TS     PRIORITY +24D
0425   REF   4  LAST  186   05,3042  54 233 1          TS     PRIORITY +36D
0426   REF   5  LAST  186   05,3043  54 247 1          TS     PRIORITY +48D
0427   REF   6  LAST  186   05,3044  54 263 1          TS     PRIORITY +60D
0428   REF   7  LAST  186   05,3045  54 277 1          TS     PRIORITY +72D

0429   REF  11  LAST  178   05,3046  55'302 0          TS     DSRUPTSW
0430   REF   1               05,3047  54 067 1          TS     NEWJOB        SHOWS NO ACTIVE JOBS.

0431   REF   1               05,3050  3 3147 0          CAF    VAC1ADRC      MAKE ALL VAC AREAS AVAILABLE.
0432   REF   1               05,3051  54 400 1          TS     VAC1USE
0433   REF   1               05,3052  6 3150 0          AD     LTHVACA
0434   REF   1               05,3053  54 454 0          TS     VAC2USE
0435   REF   2  LAST  186   05,3054  6 3150 0          AD     LTHVACA
0436   REF   1               05,3055  54 530 0          TS     VAC3USE
0437   REF   3  LAST  186   05,3056  6 3150 0          AD     LTHVACA
0438   REF   1               05,3057  54 604 1          TS     VAC4USE
0439   REF   4  LAST  186   05,3060  6 3150 0          AD     LTHVACA
0440   REF   1               05,3061  54 660 0          TS     VAC5USE

0441   REF   1               05,3062  3 4377 0          CAF    TEN           BLANK DSKY REGISTERS (PROGRAM,VERB,NOUN,
A0442                                                                       R1,R2,R3)
0443   REF  10  LAST  184   05,3063  54 154 0  DSPOFF   TS     MPAC
0444   REF   9  LAST   6C   05,3064  4 4677 1          CS     BIT12
0445   REF  11  LAST  186   05,3065  5C 154 1          INDEX  MPAC
0446   REF  22  LAST  182   05,3066  55'023 0          TS     DSPTAB
0447   REF  12  LAST  186   05,3067  1C 154 0          CCS    MPAC
0448   REF   1               05,3070  1 3063 0          TCF    DSPOFF

0449   REF   1               05,3071  55'141 0          TS     DELAYLOC
045C   REF   2  LAST  186   05,3072  55'142 0          TS     DELAYLOC +1
0451   REF   3  LAST  186   05,3073  55'143 1          TS     DELAYLOC +2
04515  REF   4  LAST  186   05,3074  55'144 0          TS     DELAYLOC +3
```

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0452   REF   1                 05,3075  55'073 C          TS      R1SAVE
0453   REF   1                 05,3076  54 045 1          TS      INLINK
0454   REF   7  LAST  130      05,3077  54 776 C          TS      DSPCNT
0455   REF   1                 05,3100  55'042 1          TS      CADRSTOR
0456   REF   1                 05,3101  55'013 C          TS      REQRET
0457   REF   1                 05,3102  55'015 C          TS      CLPASS
0458   REF   1                 05,3103  55'012 1          TS      DSPLOCK
0459   REF   1                 05,3104  55'020 C          TS      MONSAVE       KILL MONITOR
0460   REF   1                 05,3105  55'021 1          TS      MONSAVE1
0461   REF   1                 05,3106  55'001 C          TS      VERBREG
0462   REF   1                 05,3107  55'002 C          TS      NOUNREG
0463   REF   1                 05,3110  55'043 C          TS      DSPLIST
0464   REF   1                 05,3111  55'330 1          TS      MARKSTAT
0465   REF   1                 05,3112  55'322 1          TS      IMUCADR
0466   REF   1                 05,3113  55'323 C          TS      OPTCADR
0467   REF   1                 05,3114  55'324 1          TS      RADCADR
0468   REF   2  LAST   78      05,3115  55'325 C          TS      ATTCADR
0469   REF   1                 05,3116  55'304 C          TS      LGYRC
0470   REF   1                 05,3117  54 100 1          TS      FLAGWRD4      KILL INTERFACE DISPLAYS
0471   REF   1                 05,3120  3 4717 1          CAF     NOUTCON
0472   REF   5  LAST  132      05,3121  55'016 C          TS      NOUT

0473   REF  22  LAST  185      05,3122  3 4675 1          CAF     BIT14
0474   REF   2  LAST  179      05,3123  7 1044 1          MASK    EXTVBACT
0475   REF   3  LAST  187      05,3124  55'044 1          TS      EXTVBACT
0476   REF   1                 05,3125  3 3146 1          CAF     LESCHK        SELF CHECK GO-TO REGISTER.
0477   REF   2  LAST   79      05,3126  55'361 C          TS      SELFRET

0478   REF   1                 05,3127  4 4374 1          CS      VD1
0479   REF   2  LAST  131      05,3130  54 777 1          TS      DSPCOUNT

0480   REF  18  LAST  184      05,3131  0 0002 C          TC      Q
0481   REF  1C  LAST  163      05,3132  3 0001 C  T5IDLOC  CA      L             T5RUPT COMES HERE EVERY 163.84 SECS
0482   REF   1                 05,3133  1 5225 C          TCF     NOQRSM +1     WHEN NOBODY IS USING IT.

0483   REF   2  LAST  102      E6,1672                    EBANK=  OGANCW
0484   REF   1                 05,3134    03132 1  T5IDLER  2CADR  T5IDLCC
0484   REF   1                 05,3135    12066 1
0485   REF   3  LAST  187      E6,1672                    EBANK=  OGANCW
0486   REF   1                 05,3136    02071 C          2CADR  REDORCS
0486   REF   1                 05,3137    42066 1
0487   REF   4  LAST  187      E6,1672                    EBANK=  OGANCW
0488   REF   1                 05,3140    03165 C          2CADR  REDOTVC
0488   REF   1                 05,3141    34066 C
0489   REF   5  LAST  187      E6,1672                    EBANK=  OGANCW
0490   REF   1                 05,3142    02765 1          2CADR  REDOSAT
0490   REF   1                 05,3143    46066 C
0491                           05,3144    00435 C  IFAILINH OCT    435
0492   REF   1                 05,3145    03340 C  LDNPHASI GENADR DNPHASE1
0493   REF   1                 05,3146    03333 1  LESCHK   GENADR SELFCHK
```

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0494   REF  2 LAST 186   05,3147   00400 0   VAC1ADRC ADRES  VAC1USE
0495                     05,3150   00054 0   LTHVACA  DEC    44

04955                    05,3151   20100 1   INTMASK  OCT    20100
0496                     05,3152   00070 0   OCT70    OCT    00070
0497                     05,3153   74160 0   OCT74160 OCT    74160
0498   REF 13 LAST 185   05,3154   01400 1   STARTEB  ECADR  LST1
0499   REF  1              4715             NUMGRPS  EQUALS FIVE
0500                     05,3155   77755 0   -ELR     OCT    -22          -ERROR LIGHT RESET KEY CODE.
0501                     05,3156   37411 1   IM30INIF OCT    37411        INHIBITS IMU FAIL FOR 5 SEC AND PIP ISSW
0502                     05,3157   37000 0   IM30INIR OCT    37000
0503   REF  2 LAST 154     4763             IM33INIT =      PRIO16       NO PIP OR TM FAIL SIGNALS.
0504                     05,3160   00450 0   9,6,4    OCT    450
0505                     05,3161   00130 0   OPTINITF OCT    130
0506                     05,3162   00430 0   OPTINITR OCT    430
0507                     05,3163   00000 1   SWINIT   OCT    0
0508                     05,3164   00000 1             OCT    0
0509                     05,3165   00000 1             OCT    0
0510                     05,3166   00000 1             OCT    0

0511                     05,3167   00000 1             OCT    0
0512                     05,3170   00200 0             OCT    00200
0513                     05,3171   00000 1             OCT    0
0514                     05,3172   00100 0             OCT    00100

0515                     05,3173   00000 1             OCT    0
0516                     05,3174   00000 1             OCT    0
05162                    05,3175   00000 1             OCT    0
```

L FRESH START AND RESTART USER'S PAGE NO. 14 E3 S3

P0517 PROGRAM NAME GOTOPOOH ASSEMBLY SUNDISK
R0518 LOG SECTION FRESH START AND RESTART

R0519 FUNCTIONAL DESCRIPTION

R0520 1. DISPLAY MAJOR MODE NUMBER 00 IN DSKY REGISTER R1 AND R3. FLASH V50 N07 ON DSKY. (M M CHANGE REQUEST)
R0522 2. PERMIT A CURRENT PENDING REQUEST (FLASH ON DSKY) TO BE REPLACED (WITHOUT AN ABORT) BY THE MAJOR MODE
R0524 CHANGE REQUEST

R0525 INPUT/OUTPUT INFORMATION

R0526 A. CALLING SEQUENCE TC GOTOPOOH

R0527 B. ERASABLE INITIALIZATION NONE

R0528 C. OUTPUT FLASH VERB 50 NOUN 07 ON DSKY

R0529 D. DEBRIS L

R0530 PROGRAM ANALYSIS

R0531 A. SUBROUTINES CALLED GOPERF3, LINUS

R0532 B. NORMAL EXIT TCF ENDOFJOB

R0533 C. ALARM AND ABORT EXITS NONE

```
0534                          4106                    BLOCK   02
0535    REF   1               4000                    SETLOC  FFTAG10
0536                          4106                    BANK

0537    REF   1                                       COUNT   02/P00

0538    REF   1               4106  0 5301 C  GOTOPOOH TC      PHASCHNG        RESTART GOTOPOOH
0539                          4107   00014 1          OCT     14

0540    REF   3  LAST  18C    4110  0 4574 C          TC      POSTJUMP
0541    REF   1               4111   10000 C          CADR    GOPOOFIX
0542                       10,2203                    BANK    10
0543    REF   1            04,2000                    SETLOC  VERB37
0544                       04,2000                    BANK

0545    REF   1                                       COUNT   04/P00

0546    REF   1            04,2000  0 2315 1  GOPOOFIX TC      INITSUB
05465   REF   1            04,2001  3 2007 1          CAF     V37N99
0547    REF   1            04,2002  0 4555 C          TC      BANKCALL
0548    REF   1            04,2003   20624 C          CADR    GOFLASH
0549                       04,2004  1 2001 C          TCF     -3
0550                       04,2005  1 2001 C          TCF     -4
```

L FRESH START AND RESTART USER'S PAGE NO. 15 E3 S3

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0551                    C4,2006  1 2001 C          TCF    -5
0552                    04,2007   11343 C  V37N99  VN     3799
```

R0553 PROGRAM NAME V37 ASSEMBLY SUNDISK
R0554 LCC SECTION FRESH START AND RESTART

R0555 FUNCTIONAL DESCRIPTION

R0556 1. CHECK IF NEW PROGRAM ALLOWED. IF BIT 1 OF FLAGWRD2(NODOFLAG) ISSET, AN ALARM 1520 IS CALLED.
R0558 2. CHECK FOR VALIDITY OF PROGRAM SELECTED. IF AN INVALID PROGRAM IS SELECTED, THE OPERATOR ERROR LIGHT IS
R0560 SET AND CURRENT ACTIVITY, IF ANY, CONTINUES.
R0561 3. SERVICER IS TERMINATED IF IT HAS BEEN RUNNING.
R0562 4. INSTALL IS EXECUTED TO AVOID INTERRUPTING INTEGRATION.
R0563 5. THE ENGINE IS TURNED OFF AND THE DAP IS INITIALIZED FOR COAST.
R0564 6. TRACK, UPDATE AND TARG1 FLAGS ARE SET TO ZERO.
R0565 7. DISPLAY SYSTEM IS RELEASED.
R0566 8. THE FOLLOWING ARE PERFORMED FOR EACH OF THE THREE CASES.
R0567 A. PROGRAM SELECTED IS P00.
R0568 1. RENDEZVOUS FLAG IS RESET (KILL P20).
R0569 2. STATINT1 IS SCHEDULED BY SETTING RESTART GROUP 2.
R0570 3. MAJOR MODE 00 IS STORED IN THE MODE REGISTER(MODREG).
R0571 4. SUPERBANK 3 IS SELECTED.
R0572 5. NODOFLAG IS RESET.
R0573 6. ALL RESTART GROUPS EXCEPT GROUP 2 ARE CLEARED. CONTROL ISTRANSFERRED TO RESTART PROGRAM (GOPROG2)
R0575 WHICH CAUSES ALL CURRENT ACTIVITY TO BE DISCONTINUED AND A 9 MINUTE INTEGRATION CYCLE TO BE
R0577 INITIATED.
R0578 B. PROGRAM SELECTED IS P20
R0579 1. IF THE CURRENT MAJOR MODE IS THE SAME AS THE SELECTED NEWPROGRAM, THE PROGRAM IS RE-INITIALIZED
R0581 VIA V37XEQ, ALL RESTART GROUPS, EXCEPT GROUP 4 ARE CLEARED.
R0583 2. IF THE CURRENT MAJOR MODE IS NOT EQUAL TO THE NEW REQUEST, A CHECK IS MADE TO SEE IF THE REQUEST-
R0585 ED MAJOR MODE HAS BEEN RUNNING IN THE BACKGROUND,
R0586 AND IF IT HAS, NO NEW PROGRAM IS SCHEDULED, THE EXISTING
R0587 P20 IS RESTARTED TO CONTINUE, AND ITS MAJOR MODE IS SET.
R0588 3. CONTROL IS TRANSFERRED TO GOPROG2.
R0589 C. PROGRAM SELECTED IS NEITHER P00 NOR P20
R0590 1. V37XEQ IS SCHEDULED (AS A JOB) BY SETTING RESTART GROUP 4
R0591 2. ALL CURRENT ACTIVITY EXCEPT RENDEZVOUS AND TRACKING IS DISCONTINUED BY CLEARING ALL RESTART
R0593 GROUPS. GROUP 2 IS CLEARED. IF THE RENDEZVOUS FLAG IS ON P20 IS RESTARTED IN GOPROG2 VIA REDOP20.
R0595 TO CONTINUE.

R0596 INPUT/OUTPUT INFORMATION

R0597 A. CALLING SEQUENCE

R0598 CONTROL IS DIRECTED TO V37 BY THE VERBFAN ROUTINE.
R0599 VERBFAN GOES TO C(VERBTAB+C(VERBREG)). VERB 37 = MMCHANG.
R0600 MMCHANG EXECUTES A TC POSTJUMP, CADR V37.

R0601 B. ERASABLE INITIALIZATION NONE

R0602 C. OUTPUT
R0603 MAJOR MODE CHANGE

```
R0604          C. DEBRIS
R0605               MMNUMBER, MPAC +1, MINDEX, BASETEMP +C(MINDEX), FLAGWRD0, FLAGWRD1, FLAGWRD2, MODREG, GOLOC -1,
R0607               GOLOC, GOLOC +1, GOLOC +2, BASETEMP, -PHASE2, PHASE2, -PHASE4

R0608     PROGRAM ANALYSIS

R0609          A. SUBROUTINES CALLED
R0610               ALARM, RELDSP, PINBRNCH, INTSTALL, ENGINOF2, ALLCOAST, V37KLEAN, GOPROG2, FALTON, FINDVAC, SUPERSW,
R0612               DSPMM

R0613          B. NORMAL EXIT        TC ENDOFJOB

R0614          C. ALARMS      1520 (MAJOR MODE CHANGE NOT PERMITTED)

 0615                                4112                          BLOCK  02
 0616     REF   2  LAST  189        4000                          SETLOC FFTAG10
 0617                                4112                          BANK

 0618     REF   1                                                  COUNT  02/V37

 0619                                4112    00024 1  OCT24        MM     20
 0620                                4113    00031 0  OCT31        MM     25
 0621                              27,2000                         BANK   27
 0622     REF   2  LAST  189       04,2000                         SETLOC VERB37
 0623                              04,2010                         BANK

 0624     REF   1                                                  COUNT  04/V37

 0625     REF   1                  04,2010  54 775 0  V37          TS     MMNUMBER        SAVE MAJOR MODE
 0626     REF   3  LAST  184       04,2011  3 4371 0               CAF    PRIO30          RESTART AT PINBALL PRIORITY
 0627     REF   2  LAST  179       04,2012  54 366 0               TS     RESTREG

 0628     REF  37  LAST  182       04,2013  3 1320 1               CA     IMODES30        IS IMU BEING INITIALIZED
 0629     REF  22  LAST  185       04,2014  7 4705 0               MASK   BIT6
 0630     REF  43  LAST  183       04,2015  10 000 0               CCS    A
 0631     REF   1                  04,2016  1 2070 0               TCF    CANTROO

 0632     REF  16  LAST  184       04,2017  3 4676 1               CAF    BIT13           IS ENGINE ON
 0633                              04,2020  0 0006 1               EXTEND
 0634     REF   9  LAST  185       04,2021  02 011 0               RAND   DSALMOUT
 0635     REF  44  LAST  192       04,2022  10 000 0               CCS    A
 0636     REF   1                  04,2023  1 2030 1               TCF    ROOTOPOO        YES, SET UP FOR POO

 0637     REF   3  LAST  183       04,2024  4 0102 0               CS     FLAGWRD6        NO, IS TVC DAP ON
 0638     REF   2  LAST  183       04,2025  7 4105 0               MASK   OCT60000
 0639                              04,2026  0 0006 1               EXTEND
 0640     REF   1                  04,2027  6 2061 1               BZMF   ISITPOO         NO, CONTINUE WITH ROO

 0641                              04,2030  0 0004 0  ROOTOPOO     INHINT
 06412    REF   2  LAST  183       04,2031  3 4752 0               CAF    EBANK6
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0642   REF   5  LAST 185   04,2032  54 003 C          TS      EBANK
0643   REF   3  LAST 172   E6,1466                    EBANK=  DAPDATR1
0644   REF   1             04,2033  31'474 1          CAE     CSMMASS
0645   REF   2  LAST 102   04,2034  55'662 C          TS      MASSTMP
0647   REF  10  LAST 183   04,2035  0 4633 C          TC      IBNKCALL
0648   REF   1             04,2036   50741 C          CADR    SPSOFF
0649   REF  11  LAST 193   04,2037  0 4633 C          TC      IBNKCALL
0650   REF   1             04,2040   13176 C          CADR    MASSPROP
0651   REF   1             04,2041  3 2402 C          CAF     3.1SEC
0652   REF  12  LAST 193   04,2042  0 4633 C          TC      IBNKCALL
0653   REF   1             04,2043   42011 1          CADR    RCSDAPON +1

0654   REF  13  LAST 193   04,2044  0 4633 C          TC      IBNKCALL
0655   REF   1             04,2045   51005 C          CADR    TVCZAP          DISABLE TVC
0656   REF  15  LAST 186   04,2046  3 4714 1          CAF     ZERO
0657   REF   2  LAST 192   04,2047  54 775 C          TS      MMNUMBER
0658                       04,2050  0 0003 1          RELINT
0659   REF   2  LAST 188   04,2051  3 4715 C          CAF     FIVE
066C   REF   2  LAST 189   04,2052  0 4555 C          TC      BANKCALL
06602  REF   1             04,2053   01730 1          CADR    DELAYJOB
06604  REF  16  LAST 193   04,2054  3 4714 1          CAF     ZERO
06606                      04,2055  0 0006 1          EXTEND
06608                      04,2056  01 005 C          WRITE   5
0661                       04,2057  0 0006 1          EXTEND
06615                      04,2060  01 006 C          WRITE   6
0662   REF   3  LAST 193   04,2061  3 0775 1  ISITPOO  CA      MMNUMBER
0663                       04,2062  0 0006 1          EXTEND
0664   REF   1             04,2063  1 2112 C          BZF     ISSERVON        YES, CHECK SERVICER STATUS

0665   REF   3  LAST 185   04,2064  4 0076 1          CS      FLAGWRD2        NO, IS NODO V37 FLAG SET
0666   REF  23  LAST 185   04,2065  7 4712 C          MASK    BIT1
0667   REF  45  LAST 192   04,2066  10 000 C          CCS     A
0668   REF   1             04,2067  1 2075 C          TCF     CHECKTAB        NO
0669   REF  11  LAST 184   04,2070  0 5537 C  CANTROO  TC      ALARM
0670                       04,2071   01520 1          OCT     1520

0671   REF   1             04,2072  0 4473 C  V37BAD   TC      RELDSP          RELEASES DISPLAY FROM ASTRONAUT

0672   REF   4  LAST 189   04,2073  0 4574 C          TC      POSTJUMP        BRING BACK LAST NORMAL DISPLAY IF THERE
0673   REF   1             04,2074   21176 1          CADR    PINBRNCH        WAS ONE. CY

0674   REF   1             04,2075  3 2475 C  CHECKTAB CA      NOV37NN         THE NO. OF NN
0675   REF  13  LAST 186   04,2076  54 155 1  AGAINNN  TS      MPAC +1
0676   REF  14  LAST 193   04,2077  50 155 C          NDX     MPAC +1
0677   REF   1             04,2100  3 2440 C          CA      PREMM1          OBTAIN WHICH MM THIS IS FOR
0678   REF   1             04,2101  7 6043 1          MASK    LOW7
0679                       04,2102  4 0000 C          COM
0680   REF   4  LAST 193   04,2103  6 0775 1          AD      MMNUMBER
0681   REF  46  LAST 193   04,2104  10 000 C          CCS     A
0682   REF  15  LAST 193   04,2105  10 155 1          CCS     MPAC +1         IF GR, SEE IF ANYMORE IN LIST
```

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0683   REF   1                 04,2106  1 2076 C            TCF     AGAINMM         YES, GET NEXT ONE
0684   REF   1                 04,2107  1 2257 1            TCF     V37NONO         LAST TIME OR PASSED MM

0685   REF  16  LAST  193      04,2110  3 0155 C            CA      MPAC +1
0686   REF   1                 04,2111  54 774 1            TS      MINDEX          SAVE INDEX FOR LATER

0687   REF   1                 04,2112  4 0103 1  ISSERVON  CS      FLAGWRD7        V37 FLAG SET - I.E. IS SERVICER GOING
0688   REF  23  LAST  192      04,2113  7 4705 C            MASK    BIT6
0689   REF  47  LAST  193      04,2114  10 000 C            CCS     A
0690   REF   1                 04,2115  1 2123 1            TCF     CANV37          NO

0691                           04,2116  0 0004 C            INHINT
0692   REF  24  LAST  193      04,2117  4 4712 C            CS      BIT1            YES, TURN OFF AVERAGE G FLAG AND WAIT
0693   REF   1                 04,2120  7 0075 1            MASK    FLAGWRD1        FOR SERVICER TO RETURN TO CANV37
0694   REF   2  LAST  194      04,2121  54 075 1            TS      FLAGWRD1

0695   REF   1                 04,2122  1 5112 1            TCF     ENDOFJOB

0714   REF   1                 04,2123  3 2377 C  CANV37    CAF     RODAD
0715   REF   1                 04,2124  54 374 C            TS      TEMPFLSH

0716   REF   2  LAST  189      04,2125  0 5301 C            TC      PHASCHNG
0717                           04,2126   00014 1            OCT     14

0718   REF   1                 04,2127  0 6006 1  ROO       TC      INTPRET

0719                           04,2130   77624 1            CALL                    WAIT FOR INTEGRATION TO FINISH
0720   REF   1                 04,2131   27371 1                    INTSTALL
0721                           04,2132   77776 1  DUMMYAD   EXIT

07211  REF   2  LAST  189      04,2133  0 2315 1            TC      INITSUB

07212  REF   1                 04,2134  0 5447 C            TC      DOWNFLAG
07213  REF   1                 04,2135   00020 C            ADRES   STIKFLAG

072133 REF   3  LAST  193      04,2136  0 4555 C            TC      BANKCALL
072134 REF   1                 04,2137   57721 1            CADR    UPACTOFF        TURN OFF UPLINK ACTIV LIGHT

072135 REF   2  LAST  194      04,2140  0 5447 C            TC      DOWNFLAG
072136 REF   1                 04,2141   00215 1            ADRES   VHFRFLAG
07214  REF   3  LAST  194      04,2142  0 5447 C            TC      DOWNFLAG
07215  REF   1                 04,2143   00037 C            ADRES   R21MARK

0722   REF   5  LAST  193      04,2144  10 775 C            CCS     MMNUMBER        IS THIS A POOH REQUEST
0723   REF   1                 04,2145  1 2245 1            TCF     NOUVEAU         NO, PICK UP NEW PROGRAM

0724   REF   2 LAST  189 TO  192:      8      8*           COUNT   04/POO

0725   REF   2  LAST  193      04,2146  0 4473 C  POOH      TC      RELDSP          RELEASE DISPLAY SYSTEM
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07255  REF   1                  04,2147  3 4754 C            CAF     PRIO5          SET VARIABLE RESTART REGISTER FOR P00.
07256  REF   1                  04,2150  55'056 1            TS      PHSPRDT2

0726                            04,2151  0 0004 C            INHINT

0727   REF  25  LAST  194       04,2152  4 4712 C            CS      BIT1           TURN OFF NODOFLAG
0728   REF   4  LAST  193       04,2153  7 0076 1            MASK    FLAGWRD2
0729   REF   5  LAST  195       04,2154  54 076 1            TS      FLAGWRD2

0730   REF   3  LAST  193       04,2155  3 4715 C            CA      FIVE           SET 2.5 RESTART FOR STATEINT1
0731   REF  11  LAST  187       04,2156  54 0C1 1            TS      L
0732                            04,2157  4 0000 C            COM
0733   REF   2  LAST  18C       04,2160  52 755 1            DXCH    -PHASE2

0734   REF   1                  04,2161  4 2374 1            CS      BIT7-8         RESET IMUSE + KILL P20 BY TURNING OFF
0735   REF   1                  04,2162  7 0074 C            MASK    FLAGWRD0
0736   REF   2  LAST  195       04,2163  54 074 C            TS      FLAGWRD0                       RENDFLG

0737   REF   1                  04,2164  3 4714 1            CAF     DNLADP00

0738   REF   2 LAST  192 TO  194:    94     94*               COUNT   04/V37

0739   REF   3  LAST  178       04,2165  54 332 1  SEUDOP00  TS      DNLSTCOD       SET UP APPROPRIATE DOWNLIST.
A0740                                                                                 (OLD ONE WILL BE FINISHED FIRST)
 0741  REF   1                  04,2166  4 2375 C            CS      OCT01120       TURN OFF TRACK, TARG1, UPDATE FLAGS
 0742  REF   2  LAST  179       04,2167  55'071 1            TS      EBANKTEM
 0743  REF   3  LAST  194       04,2170  7 0075 1            MASK    FLAGWRD1
 0744  REF   4  LAST  195       04,2171  54 075 1            TS      FLAGWRD1

 0751  REF  14  LAST  193       04,2172  0 4633 C  GROUPKIL  TC      IBNKCALL       KILL GROUPS 3(5,6
 0752  REF   1                  04,2173   12477 C            CADR    V37KLEAN

 0753  REF   6  LAST  194       04,2174  10 775 C            CCS     MMNUMBER       IS IT POOH
 0754  REF   1                  04,2175  1 2204 1            TCF     RENDVOC        NO
 0755  REF  15  LAST  195       04,2176  0 4633 C            TC      IBNKCALL
 0756  REF   1                  04,2177   12471 C            CADR    POOKLEAN       REDUNDANT EXCEPT FOR GROUP 4.

 0757  REF   7  LAST  195       04,2200  3 0775 1  GOMOD     CA      MMNUMBER
 0758  REF   3  LAST  184       04,2201  55'011 1            TS      MODREG

 0759  REF   5  LAST  193       04,2202  0 4574 C  GOGOPROG  TC      POSTJUMP
 0760  REF   1                  04,2203   12632 C            CADR    GOPROG2

 0761  REF   8  LAST  195       04,2204  4 0775 C  RENDVOC   CS      MMNUMBER       IS NEW PROG = 20
 0762  REF   2  LAST  16C       04,2205  6 4112 1            AD      OCT24          20
 0763                            04,2206  0 0006 1            EXTEND
 0764  REF   1                  04,2207  1 2211 C            BZF     RENDNOC        YES
 0765  REF   1                  04,2210  1 2221 C            TCF     POOFIZZ
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0766   REF   9  LAST  195   04,2211  4 0775 C  RENDNCO  CS      MMNUMBER
0767   REF   4  LAST  195   04,2212  6 1011 C           AD      MODREG
0768                        04,2213  0 0006 1           EXTEND
0769   REF   1              04,2214  1 2225 1           BZF     KILL20

0770   REF   3  LAST  195   04,2215  3 0074 1           CA      FLAGWRD0        IS RENDEZVOO FLAG SET
0771   REF  20  LAST  184   04,2216  7 4704 1           MASK    BIT7
0772   REF  48  LAST  194   04,2217  10 000 C           CCS     A
0773   REF   1              04,2220  1 2236 C           TCF     STATQUO

0774   REF  21  LAST  196   04,2221  3 4704 C  POOFIZZ   CAF     BIT7
0775   REF   4  LAST  196   04,2222  7 0074 C           MASK    FLAGWRD0
0776   REF  49  LAST  196   04,2223  10 000 C           CCS     A
0777   REF   1              04,2224  1 2233 C           TCF     REV37
0778                        04,2225  0 0006 1  KILL20    EXTEND          NO, KILL GROUPS 1 + 2
0779   REF   9  LAST  180   04,2226  3 4714 1           DCA     NEGO
0780   REF   3  LAST  183   04,2227  52 753 1           DXCH    -PHASE1

0781                        04,2230  0 0006 1           EXTEND
0782   REF  10  LAST  196   04,2231  3 4714 1           DCA     NEGO
0783   REF   3  LAST  195   04,2232  52 755 1           DXCH    -PHASE2

0784   REF   1              04,2233  3 2376 1  REV37     CAF     V37QCAD         SET RESTART POINT
0785   REF   2  LAST  194   04,2234  54 374 C           TS      TEMPFLSH

0786   REF   1              04,2235  1 2202 1           TCF     GOGOPROG

0787   REF   5  LAST  195   04,2236  4 0075 1  STATQUO   CS      FLAGWRD1        SET TRACK FLAG AND UPDATE FLAG
0788   REF   1              04,2237  7 4732 1           MASK    OCT120
0789   REF   6  LAST  196   04,2240  26 075 1           ADS     FLAGWRD1

0790                        04,2241  0 0006 1           EXTEND          KILL GROUP 4
0791   REF  11  LAST  196   04,2242  3 4714 1           DCA     NEGO
0792   REF   2  LAST  180   04,2243  52 761 C           DXCH    -PHASE4

0793   REF   1              04,2244  1 2200 C           TCF     GOMOD

0794   REF  22  LAST  196   04,2245  3 4704 C  NOUVEAU   CAF     BIT7
0795   REF   5  LAST  196   04,2246  7 0074 C           MASK    FLAGWRD0
0796   REF  50  LAST  196   04,2247  10 000 C           CCS     A
0797                        04,2250  1 2253 C           TCF     +3
0798   REF   4  LAST  194   04,2251  0 5447 C           TC      DOWNFLAG        NO, RESET IMUSE FLAG.
0799   REF   1              04,2252  00007 C            ADRES   IMUSE           BIT 8 FLAG C
0800   REF   2  LAST  194   04,2253  50 774 C  +3        INDEX   MINDEX
0801   REF   1              04,2254  3 2476 C           CAF     DNLADMM1        OBTAIN NEW DOWNLIST ADDRESS

0802                        04,2255  0 0004 C           INHINT
0803   REF   1              04,2256  1 2165 C           TCF     SEUDOPOO

0804   REF   1              04,2257  0 4400 1  V37NONO   TC      FALTON          COME HERE IF MM REQUESTED DOESNT EXIST
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0805   REF   1                  04,2260  1 2072 1            TCF     V37BAD

0809   REF  16  LAST  182         4707                 OCT00010 EQUALS  BIT4
0810                             04,2261  0 0004 C    V37XEQ  INHINT
0811   REF   3  LAST  196       04,2262  5C 774 C            INDEX   MINDEX
0812   REF   2  LAST  193       04,2263  3 2440 C            CAF     PREMM1
0813   REF   1                  04,2264  55*060 1            TS      MMTEMP          OBTAIN PRIORITY BITS 15 - 11
0814   REF   1                  04,2265  54 020 1            TS      CYR             SHIFT RIGHT TO BITS 14 - 10

0815   REF   2  LAST  197       04,2266  3 0020 C            CA      CYR
0816   REF   1                  04,2267  7 7674 1            MASK    PRIO37
0817   REF   1                  04,2270  55*062 C            TS      PHSPRDT4        PRESET GROUP4 RESTART PRIORITY
0818   REF   1                  04,2271  54 063 C            TS      NEWPRIO         STORE PRIO FOR SPVAC

0819   REF   2  LAST  197       04,2272  3 1060 C            CA      MMTEMP          OBTAIN EBANK - BITS 8, 9, 10 OF MMTEMP.
0820                             04,2273  0 0006 1            EXTEND
0821   REF  17  LAST  16C       04,2274  7 4703 C            MP      BIT8
0822   REF   1                  04,2275  7 4716 1            MASK    LOW3
0823   REF  12  LAST  195       04,2276  54 001 1            TS      L
0824   REF   4  LAST  197       04,2277  5C 774 C            INDEX   MINDEX
0825   REF   1                  04,2300  3 2403 1            CAF     FCADRMM1
0826   REF   1                  04,2301  55*061 C            TS      BASETEMP
0827   REF   3  LAST  181       04,2302  7 4364 C            MASK    HI5
0828   REF  13  LAST  197       04,2303  26 001 1            ADS     L

0829   REF   2  LAST  197       04,2304  3 1061 1            CA      BASETEMP        OBTAIN GENADR PORTION OF 2CADR.
0830   REF   2  LAST   32       04,2305  7 4747 C            MASK    LOW10
0831   REF  12  LAST  138       04,2306  6 4700 1            AD      BIT11

0832   REF   1                  04,2307  0 5053 1            TC      SPVAC

0833   REF   3  LAST  197       04,2310  3 1060 C    V37XEQC CA      MMTEMP          UPON RETURN FROM FINDVAC PLACE THE
0834   REF   2  LAST  193       04,2311  7 6043 1            MASK    LOW7            NEW MM IN MODREG (THE LOW 7 BITS OF
0835   REF   1                  04,2312  0 5246 1            TC      NEWMODEA        PHSBRDT1)

R0836  FOR SUNDISK ONLY
0837   REF   3  LAST  194       04,2313  0 4473 C            TC      RELDSP          RELEASE DISPLAY
0838   REF   2  LAST  194       04,2314  0 5112 C            TC      ENDOFJOB        AND EXIT

0839                             04,2315  0 0006 1    INITSUB EXTEND
0840   REF  17  LAST  194       04,2316  22 155 C            QXCH    MPAC +1

0841   REF   3  LAST  192       04,2317  3 4752 C            CAF     EBANK6          SET E6 FOR DEADBAND CODING
0842   REF   6  LAST  193       04,2320  54 003 C            TS      EBANK           WILL BE RESET IN STARTSB2.
0843                             04,2321  0 0004 C            INHINT
0844   REF   1                  04,2322  3 0105 C            CA      FLAGWRD9        RESTORE DEADBAND
0845   REF  10  LAST  186       04,2323  7 4677 1            MASK    BIT12
0846   REF  51  LAST  196       04,2324  10 000 C            CCS     A
0847   REF   1                  04,2325  1 2331 C            TCF     SETMAXER        MAX DB SELECTED
0848   REF   4  LAST  194       04,2326  0 4555 C            TC      BANKCALL        MIN DB SELECTED
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0849   REF   1                  04,2327   50213 1          CADR    SETMINDB
0850   REF   1                  04,2330   1 2333 1         TCF     RAKE
0851   REF   5  LAST  197       04,2331   0 4555 C SETMAXER TC      BANKCALL
0852   REF   1                  04,2332   50227 C          CADR    SETMAXDB

0853   REF   2  LAST  160       04,2333   3 4717 1 RAKE    CAF     ELEVEN      THIS PART CLEARS FLAGWORD BITS.
0854   REF  18  LAST  197       04,2334   54 154 C  +1     TS      MPAC        LOOP COMES HERE.
0855   REF  19  LAST  198       04,2335   50 154 1         INDEX   MPAC
0856   REF   1                  04,2336   4 2356 1         CS      FLAGTABL
0857   REF  20  LAST  198       04,2337   50 154 1         INDEX   MPAC
0858   REF   6  LAST  196       04,2340   7 0074 C         MASK    FLAGWRD0
0859   REF  21  LAST  198       04,2341   50 154 1         INDEX   MPAC        PUT REVISED FLAGWORD BACK.
0860   REF   7  LAST  198       04,2342   54 074 C         TS      FLAGWRD0
0861   REF  22  LAST  198       04,2343   10 154 C         CCS     MPAC
0862   REF   2  LAST  198       04,2344   1 2334 C         TCF     RAKE +1     GET THE NEXT FLAGWORD.
0863                            04,2345   0 0003 1         RELINT

0864   REF   1                  04,2346   0 5435 C         TC      UPFLAG      NOW SET IMPULSW
0865   REF   1                  04,2347    00044 1         ADRES   IMPULSW

0868   REF   1                  04,2350   0 5425 1         TC      CLEARMRK

08681  REF   6  LAST  198       04,2351   0 4555 C         TC      BANKCALL
08682  REF   2  LAST  183       04,2352    45245 C         CADR    STOPRATE

08684  REF   5  LAST  185       04,2353   3 7716 C         CA      NEGONE
08686  REF  16  LAST  179       04,2354   55'303 1         TS      OPTIND
0869   REF  23  LAST  198       04,2355   0 0155 C         TC      MPAC +1     RETURN FROM INITSUB

0870                            04,2356    00000 1 FLAGTABL OCT     0
0871                            04,2357    00040 C         OCT     00040       IDLEFAIL
0872                            04,2360    02000 C         OCT     02000       STEERSW
0873                            04,2361    00000 1         OCT     0
0874                            04,2362    00000 1         OCT     0
0875                            04,2363    04140 C         OCT     04140       V59FLAG, ENGONFLG, 3AXISFLG
0876                            04,2364    10000 0         OCT     10000       STRULLSW
0877                            04,2365    16020 1         OCT     16020       IGNFLAG, ASTNFLAG, TIMRFLAG, NOUPFLAG
0878                            04,2366    00000 1         OCT     0
0879                            04,2367    42000 1         OCT     42000       SWTOVER, V94FLAG
0880                            04,2370    00000 1         OCT     0
0881                            04,2371    00000 1         OCT     0

0882   REF   1                     5630                    NEG7    EQUALS OCT77770

0883   REF   2  LAST  166       E6,1425                            EBANK= PACTOFF
0884   REF   2  LAST  187       04,2372    03132 1 POODAPAD 2CADR  T5IDLOC
0884                            04,2373    12066 1
0885   REF   1                     1060                    MMTEMP  EQUALS PHSPRDT3
0886   REF   1                     1061                    BASETEMP EQUALS TBASE4
0887                            04,2374    00300 1 BIT7-8   OCT     300
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 0888                          04,2375   01120 0  OCT01120 OCT    01120

 0889   REF   1                04,2376   10264 0  V37QCAD  CADR   V37XEQ +3
 0890   REF   1                04,2377   10132 0  RQCAD    CADR   DUMMYAD
 0891   REF   4  LAST  193     E6,1466                    EBANK= DAPDATR1
 0892   REF   1                04,2400   02106 1  RCSADDR4 2CADR  RCSATT
 0892   REF   1                04,2401   42066 1
 0893                          04,2402   37312 0  3.1SEC   OCT    37312          2.5 + 0.6 SEC
R0894   FOR VERB 37 TWO TABLES ARE MAINTAINED. EACH TABLE HAS AN ENTRY FOR EACH
R0895   MAJOR MODE THAT CAN BE STARTED FROM THE KEYBOARD. THE ENTRIES ARE PUT
R0896   INTO THE TABLE WITH THE ENTRY FOR THE HIGHEST MAJOR MODE COMING FIRST,

R0897   TO THE LOWEST MAJOR MODE WHICH IS THE LAST ENTRY IN EACH TABLE.

R0898           THE FCADRMM TABLE CONTAINS THE FCADR OF THE STARTING JOB OF
R0899   THE MAJOR MODE.   FOR EXAMPLE,

A0900                                    FCADRMM1 FCADR  P79            START OF P 79
A0901                                             FCADR  PROG18         START OF P 18
A0902                                             FCADR  P01            START OF P 01

 0903                          04,2403             FCADRMM1 EQUALS
 0904   REF   1                04,2403   11331 0           FCADR  P79
 0905   REF   1                04,2404   11106 0           FCADR  P78
 0906   REF   1                04,2405   73433 1           FCADR  P77
 09065  REF   1                04,2406   26036 0           FCADR  P76
 0907   REF   1                04,2407   72157 1           FCADR  P75
 0908   REF   1                04,2410   72002 0           FCADR  P74
 0909   REF   1                04,2411   54320 1           FCADR  P62
 0910   REF   1                04,2412   54217 1           FCADR  P61
 0911   REF   1                04,2413   32000 0           FCADR  P54
 0912   REF   1                04,2414   31061 1           FCADR  P53
 0913   REF   1                04,2415   32000 0           FCADR  PROG52
 0914   REF   1                04,2416   31061 1           FCADR  P51
 0915   REF   1                04,2417   50412 0           FCADR  P47CSM
 0916   REF   1                04,2420   50235 0           FCADR  P41CSM
 0917   REF   1                04,2421   50002 0           FCADR  P40CSM
 0918   REF   1                04,2422   11324 1           FCADR  P39
 0919   REF   1                04,2423   11103 0           FCADR  P38
 0920   REF   1                04,2424   74502 0           FCADR  P37
 0921   REF   1                04,2425   72153 0           FCADR  P35
 0922   REF   1                04,2426   72000 1           FCADR  P34
 0923   REF   1                04,2427   73620 1           FCADR  P31
 0924   REF   1                04,2430   73604 1           FCADR  P30
 0925   REF   1                04,2431   62021 0           FCADR  P23
 0926   REF   1                04,2432   60000 1           FCADR  PROG22
 0927   REF   1                04,2433   76001 1           FCADR  PROG21
 0928   REF   1                04,2434   76207 0           FCADR  PROG20
 0929   REF   1                04,2435   73431 0           FCADR  P17
 0930   REF   1                04,2436   55655 1           FCADR  P06
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 0931   REF   1              04,2437   66001 C          FCADR  GTSCPSS1        GYROCOMPASS STANDARD LEAD IN.

R0932                THE PREMM TABLE CONTAINS THE E-BANK,MAJOR MODE, AND PRIORITY
R0933   INFORMATION, IT IS IN THE FOLLOWING FORM,

R0934                PPP PPE EEM MMM MMM

R0935                WHERE THE 7 M BITS CONTAIN THE MAJOR MODE NUMBER
R0936                      3 E BITS CONTAIN THE E-BANK NUMBER
R0937                      5 P BITS CONTAIN THE PRIORITY AT WHICH THE JOB IS
R0938                         TO BE STARTED

R0939                FOR EXAMPLE,

A0940                                        PREMM1   OCT    67213          PRIORITY     33
A0941                                                                       E-BANK        5
A0942                                                                       MAJOR MODE   11
A0943                                                 OCT    25437          PRIORITY     12
A0944                                                                       E-BANK        6
A0945                                                                       MAJOR MODE   31

 0946                      04,2440             PREMM1   EQUALS
 0947                      04,2440   27117 C           OCT    27117          MM 79  EBANK 4  PRIO 13
 0948                      04,2441   27116 1           OCT    27116          MM 78  EBANK 4  PR23 13
 0949                      04,2442   27115 1           OCT    27115          MM 77  EBANK 4  PRIO 13
 09495                     04,2443   27714 C           OCT    27714          MM 76  EBANK 7  PRIO 13
 0950                      04,2444   27113 1           OCT    27113          MM 75  EBANK 4  PRIO 13
 0951                      04,2445   27112 0           OCT    27112          MM 74  EBANK 4  PRIO13
 0952                      04,2446   27476 1           OCT    27476          MM 62  EBANK 6  PRIO 13
 0953                      04,2447   27475 1           OCT    27475          MM 61  EBANK 6  PRIO 13
 0954                      04,2450   27266 0           OCT    27266          MM 54  EBANK 5  PRIO 13
 0955                      04,2451   27265 C           OCT    27265          MM 53  EBANK 5  PRIO 13
 0956                      04,2452   27264 1           OCT    27264          MM 52  EBANK 5  PRIO 13
 0957                      04,2453   27263 C           OCT    27263          MM 51  EBANK 5  PRIO 13
 0958                      04,2454   27657 C           OCT    27657          MM 47  EBANK 7  PRIO 13
 0959                      04,2455   27451 1           OCT    27451          MM 41  EBANK 6  PRIO 13
 0960                      04,2456   27450 C           OCT    27450          MM 40  EBANK 6  PRIO 13
 0961                      04,2457   27047 1           OCT    27047          MM 39  EBANK 4  PRIO13
 0962                      04,2460   27046 C           OCT    27046          MM 38  EBANK 4  PRIO 13
 0963                      04,2461   27645 C           OCT    27645          MM 37  EBANK 7  PRIO13
 0964                      04,2462   27043 C           OCT    27043          MM 35  EBANK 4  PRIO 13
 0965                      04,2463   27042 1           OCT    27042          MM 34  EBANK 4  PRIO13
 0966                      04,2464   27637 C           OCT    27637          MM 31  EBANK 7  PRIO 13
 0967                      04,2465   27636 1           OCT    27636          MM 30  EBANK 7  PRIO 13
 0968                      04,2466   27227 C           OCT    27227          MM 23  EBANK 5  PRIO 13
 0969                      04,2467   27226 1           OCT    27226          MM 22  EBANK 5  PRIO 13
 0970                      04,2470   27025 C           OCT    27025          MM 21  EBANK 4  PRIO 13
 0971                      04,2471   27424 C           OCT    27424          MM 20  EBANK 6  PRIO 13
 0972                      04,2472   27021 1           OCT    27021          MM 17  EBANK 4  PRIO 13
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L FRESH START AND RESTART USER'S PAGE NO. 26 E6 S3

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 0973                          04,2473   27006 1          OCT    27006          MM 06  EBANK 4  PRIO 13
 0974                          04,2474   41201 1          OCT    41201          MM 01  EBANK 5  PRIO 20
R0975

R0976                THE FOLLOWING LIST IS FOR THE PURPOSE OF VERIFYING THAT THE EBA

 0977   REF   6  LAST  170    E7,1412                    EBANK= TIG             EBANK SETTING REQUIRED BY MM 76
 0978   REF   4  LAST   89    E4,1763                    EBANK= KT              EBANK SETTING REQUIRED BY MM 75
 0979   REF   2  LAST   89    E4,1770                    EBANK= SUBEXIT         EBANK SETTING REQUIRED BY MM 74
 0980   REF   2  LAST  108    E6,1661                    EBANK= AOG             EBANK SETTING REQUIRED BY MM 62
 0981   REF   3  LAST  201    E6,1661                    EBANK= AOG             EBANK SETTING REQUIRED BY MM 61
 0982   REF   3  LAST  168       0302                    EBANK= BESTI           EBANK SETTING REQUIRED BY MM 54
 0983   REF   1                 0304                    EBANK= STARIND         EBANK SETTING REQUIRED BY MM 53
 0984   REF   4  LAST  201       0302                    EBANK= BESTI           EBANK SETTING REQUIRED BY MM 52
 0985   REF   2  LAST  201       0304                    EBANK= STARIND         EBANK SETTING REQUIRED BY MM 51
 0986   REF   4  LAST  121    E7,1672                    EBANK= P40TMP          EBANK SETTING REQUIRED BY MM 47
 0987   REF   2  LAST  120    E7,1477                    EBANK= AXISCODE        EBANK SETTING REQUIRED BY MM 41
 0988   REF   2  LAST  109    E6,1510                    EBANK= KMPAC           EBANK SETTING REQUIRED BY MM 40
 0989   REF   5  LAST  201    E4,1763                    EBANK= KT              EBANK SETTING REQUIRED BY MM 35
 0990   REF   3  LAST  201    E4,1770                    EBANK= SUBEXIT         EBANK SETTING REQUIRED BY MM 34
 0991   REF   2  LAST  119    E7,1625                    EBANK= +MGA            EBANK SETTING REQUIRED BY MM 30
 0992   REF   3  LAST  174    E5,1751                    EBANK= LANDMARK        EBANK SETTING REQUIRED BY MM 23
 0993   REF   2  LAST   69       0301                    EBANK= MARKINDX        EBANK SETTING REQUIRED BY MM 22
 0994   REF   2  LAST  125    E7,1777                    EBANK= WHOCARES        EBANK SETTING REQUIRED BY MM 21
 0995   REF   1                E6,1412                    EBANK= ESTROKER        EBANK SETTING REQUIRED BY MM 20
 0996   REF   2  LAST   76       1150                    EBANK= TIME2SAV        EBANK SETTING REQUIRED BY MM 06
 0997   REF   1                E5,1425                    EBANK= QPLACE          EBANK SETTING REQUIRED BY MM 01

R0998   NOTE,        THE FOLLOWING CONSTANT IS THE NUMBER OF ENTRIES IN EACH OF
R0999   ----         THE ABOVE LISTS-1(IE, THE NUMBER OF MAJOR MODES(EXCEPT P00)
R1000                THAT CAN BE CALLED FROM THE KEYBOARD MINUS ONE)

 1001                          04,2475            EPREMM1  EQUALS                 END OF PREMM1 TABLE
 1002   REF   3  LAST  197    04,2440                       SETLOC PREMM1         THIS CODING WILL AUTOMATICALLY CHANGE
 1003   REF   1                 0035            NO.MMS   =MINUS EPREMM1         THE 'NOV37MM' CONSTANT AS ENTRIES ARE
 1004   REF   3  LAST  192    04,2000                       SETLOC VERB37         INSERTED(IN) OR DELETED(FROM) THE
 1005                          04,2475                       BANK                  'PREMM1' TABLE.

 1006   REF   1                04,2475   00034 0  NOV37MM  ADRES  NO.MMS -1     ITEMS IN 'PREMM1'TABLE - 1. *DON'T MOVE*

 1007                          04,2476            ENLADMM1 EQUALS
 1008   REF   1                04,2476   00002 0          ADRES  RENDEZVU       P79
 1009   REF   2  LAST  201    04,2477   00002 0          ADRES  RENDEZVU       P78
 1010   REF   3  LAST  201    04,2500   00002 0          ADRES  RENDEZVU       P77
 10105  REF   4  LAST  201    04,2501   00002 0          ADRES  RENDEZVU       P76
 1011   REF   5  LAST  201    04,2502   00002 0          ADRES  RENDEZVU       P75
 1012   REF   6  LAST  201    04,2503   00002 0          ADRES  RENDEZVU       P74
```

```
 1013   REF   1                  04,2504   00001 0          ADRES  ENTRYUPD      P62
 1014   REF   1                  04,2505   00003 1          ADRES  POWERED       P61
 1015   REF   1                  04,2506   00000 1          ADRES  COSTALIN
 1016   REF   2  LAST  202       04,2507   00000 1          ADRES  COSTALIN
 1017   REF   3  LAST  202       04,2510   00000 1          ADRES  COSTALIN      P52
 1018   REF   4  LAST  202       04,2511   00000 1          ADRES  COSTALIN      P51
 1019   REF   2  LAST  202       04,2512   00003 1          ADRES  POWERED       P47
 1020   REF   3  LAST  202       04,2513   00003 1          ADRES  POWERED       P41
 1021   REF   4  LAST  202       04,2514   00003 1          ADRES  POWERED       P40
 1022   REF   7  LAST  201       04,2515   00002 0          ADRES  RENDEZVU      P39
 1023   REF   8  LAST  202       04,2516   00002 0          ADRES  RENDEZVU      P38
 1024   REF   9  LAST  202       04,2517   00002 0          ADRES  RENDEZVU      P37
 1025   REF  10  LAST  202       04,2520   00002 0          ADRES  RENDEZVU      P35
 1026   REF  11  LAST  202       04,2521   00002 0          ADRES  RENDEZVU      P34
 1027   REF  12  LAST  202       04,2522   00002 0          ADRES  RENDEZVU
 1028   REF  13  LAST  202       04,2523   00002 0          ADRES  RENDEZVU      P30
 1029   REF  14  LAST  202       04,2524   00002 0          ADRES  RENDEZVU      P23
 1030   REF   1                  04,2525   00004 0          ADRES  P22DNLST      P22
 1031   REF  15  LAST  202       04,2526   00002 0          ADRES  RENDEZVU      P21
 1032   REF  16  LAST  202       04,2527   00002 0          ADRES  RENDEZVU      P20
 1033   REF  17  LAST  202       04,2530   00002 0          ADRES  RENDEZVU      P17
 1034   REF   5  LAST  202       04,2531   00000 1          ADRES  COSTALIN      P06
 1035   REF   6  LAST  202       04,2532   00000 1          ADRES  COSTALIN      P01
 1036   REF  17  LAST  193          4714                 DNLADPOO =     ZERO
 1037                             0000                 COSTALIN =     0
 1038                             0001                 ENTRYUPD =     1
 1039                             0002                 RENDEZVU =     2
 1040                             0003                 POWERED  =     3

 1041                             0004                 P22DNLST =     4
R1042   ORBITAL INTEGRATION CONSTANTS

R1043   THESE CONSTANTS ARE USED IN COMPUTING THE SETTING OF MIDFLAG.
 1044                      04,2533   00465 0  RMM      2DEC   2538.09 E3 B-27 800 KM ABOVE LUNAR SURFACE
 1044                      04,2534   32324 0
 1045                      04,2535   00333 1  RME      2DEC   7178165 B-29    800 KM ABOVE EQ. RADIUS
 1045                      04,2536   01733 1
 1046                      13,2000                     BANK   13
 1047   REF   1            13,2000                     SETLOC INTINIT
 1048                      13,2000                     BANK

 1049   REF   1                                        COUNT* $$/INTIN

 1050   REF   2  LAST  83  E3,1554                     EBANK= RRECTCSM

 1051                      13,2000   43014 0  STATEUP  SET    BOF            EXTRAPOLATE CM STATE VECTOR
 1052   REF   1            13,2001   01474 1                   VINTFLAG
 1053   REF   1            13,2002   01751 0                   ORBWFLAG       ALSO 6X6 W-MATRIX IF VALID
 1054                      13,2003   26006 0                   +3                   FOR ORBITAL NAVIGATION
 1055                      13,2004   77614 1           SET
```

```
1056   REF   1                13,2005   01476 0                DIMOFLAG
1057                          13,2006   45014 0          CLEAR CALL
1058   REF   1                13,2007   01667 1                PRECIFLG
1059   REF   1                13,2010   27113 1                INTEGRV
1060                          13,2011   71214 0          BON   DLOAD
1061   REF   1                13,2012   04307 1                SURFFLAG
1062   REF   1                13,2013   26031 1                STATEND
1063   REF   2  LAST   83     13,2014   01571 0                TETCSM
1064   REF   1                13,2015   34041 0          STCALL TDEC1
1065   REF   2  LAST  194     13,2016   27371 1                INTSTALL
1066                          13,2017   45014 0          CLEAR CALL          EXTRAPOLATE LM STATE VECTOR
1067   REF   2  LAST  202     13,2020   01674 0                VINTFLAG
1068   REF   1                13,2021   26621 0                SETIFLGS          AND 6X6 W-MATRIX IF VALID
1069                          13,2022   43014 0          BOF   SET
1070   REF   1                13,2023   02756 1                RENDWFLG          FOR RENDEZVOUS NAVIGATION
1071                          13,2024   26026 1                +2
1072   REF   2  LAST  203     13,2025   01476 0                DIMOFLAG
1073                          13,2026   45014 0          SET   CALL
1074   REF   2  LAST  203     13,2027   01467 0                PRECIFLG
1075   REF   2  LAST  203     13,2030   27113 1                INTEGRV
1076                          13,2031   77614 1  STATEND CLRGO
1077   REF   1                13,2032   01236 1                NODOFLAG
1078   REF   1                13,2033   26607 1                ENDINT

R1079   THISVINT IS CALLED BY MIDTCAV1 AND2

1080                          13,2034   43414 1  THISVINT SET     RVQ
1081   REF   3  LAST  203     13,2035   01474 1                   VINTFLAG
```

P0001 RESTART TABLES

R0002 ----------

R0003 THERE ARE TWO FORMS OF RESTART TABLES FOR EACH GROUP. THEY ARE KNOWN AS THE EVEN RESTART TABLES AND THE ODD
R0005 RESTART TABLES. THE ODD TABLES HAVE ONLY ONE ENTRY OF THREE LOCATIONS WHILE THE EVEN TABLES HAVE TWO ENTRIES
R0007 EACH USING THREE LOCATIONS. THE INFORMATION AS TO WHETHER IT IS A JOB, WAITLIST, OR A LONGCALL IS GIVEN BY THE
R0009 WAY THINGS ARE PUT INTO THE TABLES.
R0010 A JOB HAS ITS PRIORITY STORED IN PRDTTAB OF THE CORRECT PHASE SPOT - A POSITIVE PRIORITY INDICATES A
R0012 FINDVAC JOB, A NEGATIVE PRIORITY A NOVAC. THE 2CADR OF THE JOB IS STORED IN THE CADRTAB.
R0014 FOR EXAMPLE,

```
A0015                                   5.7SPOT  OCT     23000
A0016                                            2CADR   SOMEJOB
```

R0017 A RESTART OF GROUP 5 WITH PHASE SEVEN WOULD THEN CAUSE SOMEJOB TO BE RESTARTED AS A FINDVAC WITH PRIORITY 23.

```
R0019 5.5SPOT  OCT     -23000
A0020                                            2CADR   ANYJOB
```

R0021 HERE A RESTART OF GROUP 5 WITH PHASE 7 WOULD CAUSE ANYJOB TO BE RESTARTED AS A NOVAC WITH PRIORITY 23.
R0023 A LONGCALL HAS ITS GENADR OF ITS 2CADR STORED NEGATIVELY AND ITS BBCON STORED POSITIVELY. IN ITS PRDTTAB IS
R0025 PLACED THE LOCATION OF A CP REGISTER THAT CONTAINS THE DELTA TIME THAT LONGCALL HAD BEEN ORIGINALLY STARTED
R0027 WITH. EXAMPLE,

```
A0028                                   3.6SPOT  GENADR  DELTAT
A0029                                           -GENADR  LONGTASK
A0030                                            BBCON   LONGTASK

A0031                                            OCT     31000
A0032                                            2CADR   JOBAGAIN
```

R0033 THIS WOULD START UP LONGTASK AT THE APPROPRIATE TIME, OR IMMEDIATELY IF THE TIME HAD ALREADY PASSED. IT SHOULD
R0035 BE NOTED THAT IF DELTAT IS IN A SWITCHED E BANK, THIS INFORMATOIN SHOULD BE IN THE BBCON OFTHE 2CADR OF THE
R0037 TASK. FROM ABOVE, WE SEE THAT THE SECOND PART OF THIS PHASE WOULD BE STARTED AS A JOB WITH A PRIORITY OF 31.

R0039 WAITLIST CALLS ARE IDENTIFIED BY THE FACT THAT THEIR 2CADR IS STORED NEGATIVELY. IF PRDTTAB OF THE PHASE SPOT
R0041 IS POSITIVE, THEN IT CONTAINS THE DELTA TIME, IF PRDTTAB IS NEGATIVE THEN IT IS THE -GENADR OF AN ERASABLE
R0043 LOCATION CONTAINING THE DELTA TIME, THAT IS, THE TIME IS STORED INDIRECTLY. IT SHOULD BE NOTED AS ABOVE, THAT
R0045 IF THE TIME IS STORED INDIRECTLY, THE BBCON MUST CONTAIN THE NECESSARY E BANK INFORMATION IF APPLICABLE. WITH
R0047 WAITLIST WE HAVE ONE FURTHER OPTION, IF -0 IS STORED IN PRDTTAB, IT WILL CAUSE AN IMMEDIATE RESTART OF THE
R0049 TASK. EXAMPLES,

```
A0050                                            OCT     77777          THIS WILL CAUSE AN IMMEDIATE RESTART
A0051                                           -2CADR   ATASK          OF THE TASK :ATASK:

A0052                                            DEC     200            IF THE TIME OF THE 2 SECONDS SINCE DUMMY
A0053                                           -2CADR   DUMMY          WAS PUT ON WAITLIST IS UP, IT WILL BEGIN
A0054                                                                   IN 10 MS, OTHERWISE IT WILL BEGIN WHEN
A0055                                                                   IT NORMALLY WOULD HAVE BEGUN.
```

```
A0056                                   -GENADR DTIME           WHERE DTIME CONTAINS THE DELTA TIME
A0057                                   -2CADR  TASKTASK        OTHERWISE THIS IS AS ABOVE

R0058   *****   NOW THE TABLES THEMSELVES *****

 0059                       01,2000                  BANK   01
 0060   REF   1             01,2000                  SETLOC RESTART
 0061                       01,2000                  BANK

 0062   REF   1                                      COUNT  01/RSTAB

 0063                       01,2000          PRDTTAB EQUALS 12000        USED TO FIND THE PRIORITY OR DELTATIME
 0064                       01,2001          CADRTAB EQUALS 12001        THIS AND THE NEXT RELATIVE LOC CONTAIN
A0065                                                                   RESTART 2CADR

 0066   REF   1             01,2000  0 0063 1 SIZETAB TC     1.2SPOT -12006
 0067   REF   1             01,2001  0 0010 0         TC     1.3SPOT -12004
 0068   REF   1             01,2002  0 0063 1         TC     2.2SPOT -12006
 0069   REF   1             01,2003  0 0024 1         TC     2.3SPOT -12004
 0070   REF   1             01,2004  0 0063 1         TC     3.2SPOT -12006
 0071   REF   1             01,2005  0 0043 0         TC     3.3SPOT -12004
 0072   REF   1             01,2006  0 0063 1         TC     4.2SPOT -12006
 0073   REF   1             01,2007  0 0107 1         TC     4.3SPOT -12004
 0074   REF   1             01,2010  0 0242 0         TC     5.2SPOT -12006
 0075   REF   1             01,2011  0 0260 0         TC     5.3SPOT -12004
 0076   REF   1             01,2012  0 0336 1         TC     6.2SPOT -12006
 0077   REF   1             01,2013  0 0346 0         TC     6.3SPOT -12004
 0078   REF   2  LAST  205  01,2071           1.2SPOT EQUALS 3.2SPOT
R0079   ANY MORE GROUP 1.EVEN RESTART VALUES SHOULD GO HERE

 0080                       01,2014   00170 1 1.3SPOT DEC    120          THIS NUMBER MUST EQUAL C(JTAGTIME)
 0081   REF   4  LAST  201  E6,1661                   EBANK= AOG
 0082   REF   1             01,2015   74555 1         -2CADR SETJTAG
 0082   REF   1             01,2016   45711 1
 0083                       01,2017   10000 0 1.5SPOT OCT    10000
 0084   REF   5  LAST  199  E6,1466                   EBANK= DAPDATR1
 0085   REF   1             01,2020   02362 1         2CADR  REDO40.9
 0085   REF   1             01,2021   34066 0
 0086                       01,2022   10000 0 1.7SPOT OCT    10000
 0087   REF   2  LAST  201  E6,1412                   EBANK= ESTROKER
 0088   REF   1             01,2023   02074 0         2CADR  RELINUS
 0088   REF   1             01,2024   56066 1
 0089                       01,2025   10000 0 1.11SPOT OCT   10000
 0090   REF   3  LAST  205  E6,1412                   EBANK= ESTROKER
 0091   REF   1             01,2026   02273 0         2CADR  PIKUP20
 0091   REF   1             01,2027   76066 0
R0092   ANY MORE GROUP 1.CCC RESTART VALUES SHOULD GO HERE

 0093   REF   2  LAST  205  01,2071           2.2SPOT EQUALS 1.2SPOT
R0094   ANY MORE GROUP 2.EVEN RESTART VALUES SHOULD GO HERE
```

```
0095    REF   1                01,2030   02605 C  2.3SPOT  GENADR 600SECS
0096    REF   1                01,2031   75216 C           -GENADR STATEINT
0097    REF   3  LAST  202     E3,1554                     EBANK= RRECTCSM
0098    REF   2  LAST  206     01,2032   26063 C           BBCON  STATEINT

0099                           01,2033   05000 1  2.5SPOT  OCT    05000
0100    REF   4  LAST  206     E3,1554                     EBANK= RRECTCSM
0101    REF   1                01,2034   02570 1           2CADR  STATINT1
0101    REF   1                01,2035   26063 C
0102                           01,2036   10000 0  2.7SPOT  OCT    10000
0103    REF   3  LAST  123     E7,1734                     EBANK= MRKBUF2
0104    REF   1                01,2037   02512 C           2CADR  R22
0104    REF   1                01,2040   70067 1
0105                           01,2041   14000 1  2.11SPOT OCT    14000
0106    REF   4  LAST  201     E5,1751                     EBANK= LANDMARK
0107    REF   1                01,2042   02173 C           2CADR  V94ENTER
0107    REF   1                01,2043   62065 C
0108                           01,2044   10000 C  2.13SPOT OCT    10000
0109    REF   4  LAST  206     E7,1734                     EBANK= MRKBUF2
0110    REF   1                01,2045   02377 C           2CADR  REDOR22
0110    REF   1                01,2046   56067 C
R0111   ANY MORE GROUP 2.000 RESTART VALUES SHOULD GO HERE

0112    REF   2  LAST  205     01,2071                3.2SPOT  EQUALS 4.2SPOT

R0113   ANY MORE GROUP 3.EVEN RESTART VALUES SHOULD GO HERE

0114                           01,2047   20000 C  3.3SPOT  OCT    20000
0115    REF   3  LAST  166     E7,1427                     EBANK= TGO
0116    REF   1                01,2050   02404 C           2CADR  S40.13
0116    REF   1                01,2051   34067 1
0117                           01,2052   00000 1  3.5SPOT  DEC    0
0118                           01,2053   00000 1           DEC    0
0119                           01,2054   00000 1           DEC    0
0120                           01,2055   22000 1  3.7SPOT  OCT    22000
0121    REF   2  LAST   84     E3,1706                     EBANK= TEPHEM
0122    REF   1                01,2056   02127 1           2CADR  MATRXJOB
0122    REF   1                01,2057   70063 C
0123                           01,2060   22000 1  3.11SPOT OCT    22000
0124    REF   3  LAST  206     E3,1706                     EBANK= TEPHEM
0125    REF   1                01,2061   02247 1           2CADR  REP11
0125    REF   1                01,2062   70063 C
0126                           01,2063   22000 1  3.13SPOT OCT    22000
0127    REF   4  LAST  206     E3,1706                     EBANK= TEPHEM
0128    REF   1                01,2064   02026 1           2CADR  REP11A
0128    REF   1                01,2065   70063 C
0129    REF   4  LAST  206     01,2066   76347 C  3.15SPOT-GENADR TGO +1
0130    REF   5  LAST  206     E7,1427                     EBANK= TGO
0131    REF   1                01,2067   75067 1           -2CADR ENGINOFF
0131    REF   1                01,2070   27710 1
```

```
R0132   ANY MORE GROUP 3.CCC RESTART VALUES SHOULD GO HERE

0133                            01,2071   77777 C  4.2SPOT  OCT     77777
0134    REF   7  LAST  201      E7,1412                     EBANK=  TIG
0135    REF   1                 01,2072   75260 1           -2CADR  PRECHECK
0135    REF   1                 01,2073   27710 1
0136                            01,2074   30000 1           OCT     30000
0137    REF   2  LAST  121      E7,1674                     EBANK=  DELVIMU
0138    REF   1                 01,2075   02463 1           2CADR   P47BODY
0138    REF   1                 01,2076   50067 C
0139                            01,2077   77777 C  4.4SPOT  OCT     77777
0140    REF   8  LAST  207      E7,1412                     EBANK=  TIG
0141    REF   2  LAST  207      01,2100   75260 1           -2CADR  PRECHECK
0141                            01,2101   27710 1
0142                            01,2102   05664 0           DEC     2996
0143    REF   6  LAST  205      E6,1466                     EBANK=  DAPDATR1
0144    REF   1                 01,2103   75517 C           -2CADR  TTG/C
0144    REF   1                 01,2104   27711 C
0145                            01,2105   77777 C  4.6SPOT  OCT     77777
0146    REF   9  LAST  207      E7,1412                     EBANK=  TIG
0147    REF   3  LAST  207      01,2106   75260 1           -2CADR  PRECHECK
0147                            01,2107   27710 1
0148                            01,2110   04700 1           DEC     2496
0149    REF  10  LAST  207      E7,1412                     EBANK=  TIG
0150    REF   1                 01,2111   75254 C           -2CADR  TIG-5
0150    REF   1                 01,2112   27710 1
R0163   ANY MORE GROUP 4.EVEN RESTART VALUES SHOULD GO HERE

0164                            01,2113   00050 1  4.3SPOT  DEC     40
0165    REF   3  LAST  198      E6,1425                     EBANK=  PACTOFF
0166    REF   1                 01,2114   75166 1           -2CADR  DOTVCON
0166    REF   1                 01,2115   27711 C
0167                            01,2116   00240 1  4.5SPOT  DEC     160
0168    REF   4  LAST  207      E6,1425                     EBANK=  PACTOFF
0169    REF   1                 01,2117   75140 C           -2CADR  DOSTRULL
0169    REF   1                 01,2120   27711 C
0170                            01,2121   00764 1  4.7SPOT  DEC     500
0171    REF   5  LAST  207      E6,1425                     EBANK=  PACTOFF
0172    REF   1                 01,2122   75236 1           -2CADR  TIG-C
0172    REF   1                 01,2123   27711 C
0173                            01,2124   00372 1  4.11SPOT DEC     250
0174    REF   7  LAST  207      E6,1466                     EBANK=  DAPDATR1
0175    REF   1                 01,2125   74315 C           -2CADR  V97E40.6
0175    REF   1                 01,2126   27711 C
0176                            01,2127   00310 C  4.13SPOT DEC     200
0177    REF   3  LAST  201      E7,1777                     EBANK=  WHOCARES
0178    REF   1                 01,2130   74350 1           -2CADR  R40ENABL
0178    REF   1                 01,2131   27710 1
0179                            01,2132   16000 0  4.15SPOT OCT     16000          PRELAUNCH OPTICAL VERIFICATION
0180    REF   3  LAST  168      E5,1757                     EBANK=  OGC
```

```
0181   REF   1             01,2133  02000 C          2CADR  COMPVER        CALLS FOR OPTICS DATA AGAIN (STD LEADIN)
0181   REF   1             01,2134  66065 1
0182                        01,2135  16000 C  4.17SPOT OCT    16000         PRELAUNCH AZIMUTH CHANGE
0183   REF   3  LAST  92    E5,1671                   EBANK= XSM
0184   REF   1             01,2136  03737 1          2CADR  AZMTHCG1
0184   REF   1             01,2137  66065 1
0185   REF   5  LAST 201    01,2140  01672 C  4.21SPOT GENADR P40TMP       DELTA TIME USED IN SETTING UP
0186   REF   1             01,2141  75411 1         -GENADR TIGBLNK        LONG CALL OF TIGBLNK  BY P40,P41
0187   REF   6  LAST 208    E7,1672                   EBANK= P40TMP
0188   REF   2  LAST 208    01,2142  50067 C          BBCON  TIGBLNK
0189                        01,2143  12000 1  4.23SPOT OCT    12000         PROTECT  P40S/SV BY P40 P41
0190   REF  11  LAST 207    E7,1412                   EBANK= TIG
0191   REF   1             01,2144  02113 C          2CADR  P40S/SV
0191   REF   1             01,2145  50067 C

0192                        01,2146  24000 1  4.25SPOT OCT    24000
0193   REF   5  LAST 201      0302                    EBANK= BESTI
0194   REF   2  LAST 199    01,2147  02000 C          2CADR  PROG52
0194                        01,2150  32060 C

0195                        01,2151  00372 1  4.27SPOT DEC    250
0196   REF   6  LAST 207    E6,1425                   EBANK= PACTOFF
0197   REF   1             01,2152  75053 C         -2CADR  DOTVCRCS
0197   REF   1             01,2153  27711 C
0198                        01,2154  13000 C  4.31SPOT OCT    13000
0199   REF   2  LAST  92    E5,1765                   EBANK= STAR
0200   REF   1             01,2155  02523 1          2CADR  R51
0200   REF   1             01,2156  30065 1
0201                        01,2157  04064 1  4.33SPOT DEC    2100          PROTECT CONTINUING JOB TO START P63
0202   REF   5  LAST 209    E6,1661                   EBANK= ACG
0203   REF   1             01,2160  75403 1         -2CADR  WAKEP62
0203   REF   1             01,2161  23711 1
0204                        01,2162  12000 1  4.35SPOT OCT    12000
0205   REF   8  LAST 207    E6,1466                   EBANK= DAPDATR1
0206   REF   1             01,2163  02155 1          2CADR  POSTBURN
0206   REF   1             01,2164  50066 1
0207                        01,2165  00764 1  4.37SPOT DEC    500
0208   REF  12  LAST 208    E7,1412                   EBANK= TIG
0209   REF   1             01,2166  75273 C         -2CADR  TIGAVEG
0209   REF   1             01,2167  27710 1
0210                        01,2170  17000 1  4.41SPOT OCT    17000         PROTECT DISPLAY JOB IN P67
0211   REF   6  LAST 208    E6,1661                   EBANK= ACG
0212   REF   1             01,2171  02511 C          2CADR  P67.1
0212   REF   1             01,2172  54066 C
0213   REF   1             01,2173  76003 C  4.43SPOT-GENADR S61DT         PROTECT TASK TO START PREREAD,ENTRY
0214   REF   2  LAST 208    E6,1774                   EBANK= S61DT          S61.1C WILL CHANGE EBANK=EB7 FOR PREREAD
0215   REF   1             01,2174  75213 C         -2CADR  S61.1C
0215   REF   1             01,2175  23711 1
0216                        01,2176  13000 C  4.45SPOT OCT    13000         PROTECT CONTINUING JOB S61.1
0217   REF   7  LAST 208    E6,1661                   EBANK= ACG            (ENTRY IMU ALIGNMENT)
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0218   REF   1                 01,2177  02602 1          2CADR  S61.1A -1
0218   REF   1                 01,2200  54066 C
0219                           01,2201  17000 1  4.47SPOT OCT    17000          PROTECT HUNTEST ITERATION.
0220   REF   8  LAST  208      E6,1661                   EBANK= AOG
0221   REF   1                 01,2202  03006 1          2CADR  PRE-HUNT
0221   REF   1                 01,2203  52066 C
0222                           01,2204  77777 C  4.51SPOT OCT    77777          PROTECT FDAI ATTITUDE
0223   REF   2  LAST  112      E6,1704                   EBANK= BODY3           ERROR DISPLAY IN P11
0224   REF   1                 01,2205  75463 1         -2CADR  ATERTASK
0224   REF   1                 01,2206  07711 1
0225                           01,2207  77777 C  4.53SPOT DEC    -0
0226   REF   1                 E7,1777                   EBANK= END-E7          EBANK7 FOR TIG
0227   REF   1                 01,2210  74334 C         -2CADR  V97ETASK
0227   REF   1                 01,2211  27710 1
0228                           01,2212  13000 C  4.55SPOT OCT    13000          PROTECT  P65 RESPONSIVE DISPLAY.
0229   REF   2  LAST  115      E7,1451                   EBANK= RTINIT
0230   REF   1                 01,2213  02456 1          2CADR  P65.1
0230   REF   1                 01,2214  54067 1
0231   REF   7  LAST  208      01,2215  76105 1  4.57SPOT-GENADR P40TMP
0232   REF   8  LAST  209      E7,1672                   EBANK= P40TMP
0233   REF   1                 01,2216  75350 C         -2CADR  TIGON
0233   REF   1                 01,2217  27710 1
0234                           01,2220  77777 C  4.61SPOT OCT    77777
0235   REF   7  LAST  208      E6,1425                   EBANK= PACTOFF
0236   REF   1                 01,2221  75223 C         -2CADR  IGNITION
0236   REF   1                 01,2222  27711 C
0237                           01,2223  77777 C  4.63SPOT OCT    77777
0238   REF   8  LAST  209      E6,1425                   EBANK= PACTOFF
0239   REF   1                 01,2224  75061 1         -2CADR  DOSPSOFF
0239   REF   1                 01,2225  27711 C
0240                           01,2226  00012 1  4.65SPOT DEC    10
0241   REF  13  LAST  208      E7,1412                   EBANK= TIG
0242   REF   2  LAST  207      01,2227  75254 C         -2CADR  TIG-5
0242                           01,2230  27710 1
02421                          01,2231  77777 C  4.67SPOT DEC    -0
024211 REF   2  LAST  193      E6,1474                   EBANK= CSMMASS
024212 REF   1                 01,2232  74416 1         -2CADR  V97TTASK
024212 REF   1                 01,2233  27711 C
02422                          01,2234  00372 1  4.71SPOT DEC    250
024221 REF   9  LAST  208      E6,1466                   EBANK= DAPDATR1        (FOR RCSDAPON)
024222 REF   1                 01,2235  74401 1         -2CADR  V97TRCS
024222 REF   1                 01,2236  27711 C
02423                          01,2237  77777 C  4.73SPOT DEC    -0
024231 REF   1                 E6,1444                   EBANK= V97VCNTR
024232 REF   1                 01,2240  74364 C         -2CADR  V97PTASK
024232 REF   1                 01,2241  27711 0
024233                         01,2242  77777 C  4.75SPOT DEC    -0
024234 REF  10  LAST  209      E6,1466                   EBANK= DAPDATR1
024235 REF   1                 01,2243  74322 1         -2CADR  SPSOFF97
024235 REF   1                 01,2244  27711 C
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 024236                          01,2245   77777 C  4.77SPOT DEC     -0
 024237 REF   9  LAST  209       E6,1425                    EBANK=  PACTOFF
 024238 REF   2  LAST  207       01,2246   75236 1          -2CADR  TIG-C
 024238                          01,2247   27711 C
R0243   ANY MORE GROUP 4.000 RESTART VALUES SHOULD GO HERE

 0244                            01,2250   32000 C  5.2SPOT  OCT     32000
 0245   REF   6  LAST  114       E7,1431                    EBANK=  DVCNTR
 0246   REF   1                 01,2251   03145 1          2CADR   NORMLIZE
 0246   REF   1                 01,2252   76067 1
 0247                            01,2253   00310 C          DEC     200
 0248   REF   9  LAST  209       E6,1661                    EBANK=  AOG
 0249   REF   1                 01,2254   74563 1          -2CADR  REREADAC
 0249   REF   1                 01,2255   01711 1
 0250                            01,2256   20000 C  5.4SPOT  OCT     20000
 0251   REF   7  LAST  210       E7,1431                    EBANK=  DVCNTR
 0252   REF   1                 01,2257   03013 C          2CADR   SERVICER
 0252   REF   1                 01,2260   76067 1
 0253                            01,2261   00310 C          DEC     200
 0254   REF  10  LAST  210       E6,1661                    EBANK=  AOG
 0255   REF   2  LAST  210       01,2262   74563 1          -2CADR  REREADAC
 0255                            01,2263   01711 1
R0256   ANY MORE GROUP 5.EVEN RESTART VALUES SHOULD GO HERE

 0257                            01,2264   00310 0  5.3SPOT  DEC     200
 0258   REF  11  LAST  210       E6,1661                    EBANK=  AOG
 0259   REF   3  LAST  210       01,2265   74563 1          -2CADR  REREADAC
 0259                            01,2266   01711 1
 0260                            01,2267   77777 C  5.5SPOT  OCT     77777
 0261   REF  12  LAST  210       E6,1661                    EBANK=  AOG
 0262   REF   1                 01,2270   75117 1          -2CADR  REDO5.5
 0262   REF   1                 01,2271   01711 1
 0263                            01,2272   20000 0  5.7SPOT  OCT     20000          USED BY PRELAUNCH
 0264   REF   4  LAST  208       E5,1671                    EBANK=  XSM
 0265   REF   1                 01,2273   02456 1          2CADR   RSTGTS1
 0265   REF   1                 01,2274   66065 1
 0266                            01,2275   77777 C  5.11SPOT OCT     77777
 0267   REF   5  LAST  210       E5,1671                    EBANK=  XSM
 0268   REF   1                 01,2276   75174 1          -2CADR  ALLOCP1
 0268   REF   1                 01,2277   11712 0
 0269                            01,2300   20000 C  5.13SPOT OCT     20000
 0270   REF   6  LAST  210       E5,1671                    EBANK=  XSM
 0271   REF   1                 01,2301   02527 C          2CADR   WTLIST1
 0271   REF   1                 01,2302   66065 1
 0272                            01,2303   20000 C  5.15SPOT OCT     20000
 0273   REF   7  LAST  210       E5,1671                    EBANK=  XSM
 0274   REF   1                 01,2304   03320 C          2CADR   RESTEST1
 0274   REF   1                 01,2305   66065 1
 0275                            01,2306   20000 C  5.17SPOT OCT     20000
 0276   REF   8  LAST  210       E5,1671                    EBANK=  XSM
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0277   REF   1              01,2307   05112 C          2CADR  GEOSTRT4
0277   REF   1              01,2310   04065 C
0278                        01,2311   20000 C  5.21SPOT OCT   20000
0279   REF   9  LAST  21C   E5,1671                    EBANK= XSM
0280   REF   1              01,2312   02640 1          2CADR  ALFLT1
0280   REF   1              01,2313   66065 1
0281                        01,2314   77777 C  5.23SPOT OCT   77777
0282   REF  10  LAST  211   E5,1671                    EBANK= XSM
0283   REF   1              01,2315   75154 C         -2CADR  SPECSTS
0283   REF   1              01,2316   11712 C
0284                        01,2317   20000 C  5.25SPOT OCT   20000
0285   REF  11  LAST  211   E5,1671                    EBANK= XSM
0286   REF   1              01,2320   03331 C          2CADR  RESTEST3
0286   REF   1              01,2321   66065 1
0287                        01,2322   20000 C  5.27SPOT OCT   20000
0288   REF  12  LAST  211   E5,1671                    EBANK= XSM
0289   REF   1              01,2323   03277 C          2CADR  RESTAIER
0289   REF   1              01,2324   66065 1
0290                        01,2325   77777 C  5.31SPOT OCT   77777
0291   REF   8  LAST  21C   E7,1431                    EBANK= DVCNTR
0292   REF   1              01,2326   75163 1         -2CADR  REDO5.31
0292   REF   1              01,2327   01710 C
0293                        01,2330   20000 C  5.33SPOT OCT   20000
0294   REF  13  LAST  211   E5,1671                    EBANK= XSM
0295   REF   1              01,2331   03354 C          2CADR  RESCHNG
0295   REF   1              01,2332   66065 1
0296                        01,2333   00000 1  5.35SPOT DEC   0
0297                        01,2334   00000 1          2DEC   0
0297                        01,2335   00000 1
0298                        01,2336   77777 C  5.37SPOT OCT   77777
0299   REF  13  LAST  21C   E6,1661                    EBANK= AOG
0300   REF   1              01,2337   75035 C         -2CADR  CHEKAVEG
0300   REF   1              01,2340   01711 1
0301                        01,2341   77777 C  5.41SPOT OCT   77777        TO PROTECT PREREAD AT TIG-30A
0302   REF   9  LAST  211   E7,1431                    EBANK= DVCNTR          TIG-15 T+60
0303   REF   1              01,2342   75173 C         -2CADR  PREREAD
0303   REF   1              01,2343   01710 C
R0304  ANY MORE GROUP 5.CCC RESTART VALUES SHOULD GO HERE

0305                        01,2344   77777 C  6.2SPOT  OCT   77777        USED BY P40 AFTER GIMB OR TST TO REPOS'N
0306   REF   4  LAST  172   E6,1476                    EBANK=   AK         ENGINE UNTIL TVCDAPON
0307   REF   1              01,2345   75737 C         -2CADR  PRE40.6
0307   REF   1              01,2346   37711 1

0308                        01,2347   00144 C          DEC   100
0309   REF   2  LAST  12C   E7,1660                    EBANK= TTOGO
0310   REF   1              01,2350   74603 1         -2CADR  CLOKTASK
0310   REF   1              01,2351   27710 1

R0311  ANY MORE 6.CCC RESTART VALUES SHOULD GO HERE
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0312                          01,2352   00144 C  6.3SPOT  DEC     100
0313   REF  14  LAST  209     E7,1412                     EBANK=  TIG
0314   REF   2  LAST  211     01,2353   74603 1           -2CADR  CLOKTASK
0314                          01,2354   27710 1
0315                          01,2355   30000 1  6.5SPOT  OCT     30000          PROTECT INCREMENTING OF TIME2,TIME1 BY
0316   REF   5  LAST  206     E3,1706                     EBANK=  TEPHEM         P27NUPDATE PROGRAM)
0317   REF   1                01,2356   03535 1           2CADR   TIMEDIDR
0317   REF   1                01,2357   56063 1
0318                          01,2360   00000 1  6.7SPOT  OCT     0
0319                          01,2361   00000 1           OCT     0
0320                          01,2362   00000 1           OCT     0

0321   REF   2  LAST  109     01,2363   76052 1  6.11SPOT-GENADR  CM/GYMDT       PROTECT TASK TO READ CDUS.
0322   REF   3  LAST  212     E6,1725                     EBANK=  CM/GYMDT       FOR ENTRY DAP
0323   REF   1                01,2364   75323 1           -2CADR  READGYMB
0323   REF   1                01,2365   45711 1
0324                          01,2366   00000 1  6.13SPOT DEC     0
0325                          01,2367   00000 1           DEC     0
0326                          01,2370   00000 1           DEC     0
```

```
R0330   PROGRAM DESCRIPTION: NEWPHASE                          DATE: 11 NOV 1966
R0332   MOD: 1                                                 ASSEMBLY: SUNBURST REV
R0334   MOD BY: COPPS                                         LOG SECTION: PHASE TABLE MAINTENANCE
R0336   FUNCTIONAL DESCRIPTION:
R0337             NEWPHASE IS THE QUICK WAY TO MAKE A NON VARIABLE PHASE CHANGE. IT INCLUDES THE OPTION OF SETTING
R0339         TBASE OF THE GROUP. IF TBASE IS TO BE SET,  -C(TIME1) IS STORED IN THE TBASE TABLE AS FOLLOWS:

R0341               (L-1) TBASE0
R0342               (L)   TBASE1 (IF GROUP=1)
R0343               (L+1)
R0344               (L+2) TBASE2 (IF GROUP=2)
R0345               -----
R0346               (L+6) TBASE4 (IF GROUP=4)
R0347               (L+7)
R0348               (L+8) TBASE5 (IF GROUP=5)

R0349         IN ANY CASE, THE NEGATIVE OF THE PHASE, FOLLOWED (IN THE NEXT REGISTER)  BY THE PHASE, IS STORED IN THE
R0351         PHASE TABLE AS FOLLOWS:

R0352               (L)   -PHASE1 (IF GROUP=1)
R0353               (L+1) PHASE1
R0354               (L+2) -PHASE2 (IF GROUP=2)
R0355               (L+3) PHASE2
R0356               -----
R0357               (L+7) PHASE4
R0358               (L+8) -PHASE5 (IF GROUP=5)
R0359               (L+9) PHASE5

R0360   CALLING SEQUENCE:
R0361             EXAMPLE IS FOR PLACING A PHASE OF FIVE INTO GROUP THREE:

R0362         1) IF TBASE IS NOT TO BE SET:
A0363                                       L-1     CA      FIVE
A0364                                       L       TC      NEWPHASE
A0365                                       L+1     OCT     00003

R0366         2) IF TBASE IS TO BE SET:
A0367                                       L-1     CS      FIVE
A0368                                       L       TC      NEWPHASE
A0369                                       L+1     OCT     00003

R0370   SUBROUTINES CALLED: NONE

R0371   NORMAL EXIT MODE: AT L+2 OF CALLING SEQUENCE

R0372   ALARM OR ABORT EXITS: NONE

R0373   OUTPUT: PHASE TABLE AND TBASE TABLE UPDATED

R0374   ERASABLE INITIALIZATION REQ,D: NONE
```

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R0375   CEERIS: A,L,TEMPG

R0376   ***WARNING*** THIS PROGRAM IS TO BE PLACED IN FIXED-FIXED AND UNSWITCHED ERASABLE.

 0378                          4114                    BLOCK  02
 0379   REF   1                4000                    SETLOC FFTAG1
 0380                          4114                    BANK

 0381   REF   1                                        COUNT* $$/PHASE

 0382                          4114  0 0004 0  NEWPHASE INHINT

 0383   REF  14  LAST  197     4115  54 001 1          TS     L          SAVE FOR FURTHER USE

 0384   REF  19  LAST  187     4116  50 002 0          NDX    Q          OBTAIN THE GROUP NUMBER
 0385                          4117  3 0000 1          CA     0
 0386   REF  20  LAST  214     4120  24 002 0          INCR   Q          OBTAIN THE RETURN ADDRESS
 0387                          4121  6 0000 1          DOUBLE            SAVE THE GROUP IN A FORM USED FOR
 0388   REF   1                4122  54 061 1          TS     TEMPG      INDEXING

 0389   REF  19  LAST  214     4123  10 001 1          CCS    L          SEE IF WE ARE TO SET TBASE
 0390                          4124  1 4133 0          TCF    +7         NO, THE DELTA T WAS POSITIVE
 0391                          4125  1 4133 0          TCF    +6

 0392   REF  52  LAST  197     4126  24 000 1  NUFAZ+10 INCR   A          SET TBASE AND STORE PHASE CORRECTLY
 0393   REF  16  LAST  214     4127  54 001 1          TS     L

 0394   REF   3  LAST  127     4130  4 0025 1          CS     TIME1      SET TBASE
 0395   REF   2  LAST  214     4131  50 061 0          NDX    TEMPG
 0396   REF   1                4132  55*051 0          TS     TBASE1 -2

 0397   REF  17  LAST  214     4133  4 0001 1          CS     L          NOW PUT THE PHASE IN THE RIGHT TABLE LOC
 0398   REF   3  LAST  214     4134  50 061 0          NDX    TEMPG
 0399   REF   4  LAST  196     4135  52 751 0          DXCH   -PHASE1 -2

 0400                          4136  0 0003 1          RELINT
 0401   REF  21  LAST  214     4137  0 0002 0          TC     Q          NOW RETURN TO CALLER
```

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R0001   PROGRAM NAME - SXTMARK                          DATE- 5 APRIL 1967
R0002   PROGRAM MODIFIED BY 258/278 PROGRAMMERS        LOG SECTION SXTMARK
R0003   MOD BY- R. MELANSON TO ADD DOCUMENTATION       ASSEMBLY SUNDISK REV. 116

R0004   FUNCTIONAL DESCRIPTION-
R0005      SXTMARK IS CALLED FROM INTERNAL ROUTINES WHICH MAY REQUIRE STAR OR LANDMARK MARKINGS BY THE ASTRONAUT. IF
R0007      THE MARK SYSTEM IS NOT IN USE, SXTMARK RESERVES A VAC AREA FOR MARKING AND REQUESTS EXECUTION OF THE MKVB51
R0009      ROUTINE VIA THE EXECUTIVE JOB PRIORITY LIST. R21 USES THIS ROUTINE TO DETERMINE IF THE MARK SYSTEM CAN BE
R0011      USED. IF YES, SXTMARK RETURNS TO R21 TO PERFORM ITS OWN MARK REQUESTS VIA THE V51 FLASH.

R0013   CALLING SEQUENCE-
R0014
R0015      CAF     (NO. MARK REQUESTS IN BITS 1-3 OF A)
R0016      TC      BANKCALL
R0017      CADR    SXTMARK

R0018   NORMAL EXIT MODE-
R0019      SWRETURN

R0020   ALARM OR ABORT EXIT MODE-
R0021      ABORT

R0022   OUTPUT-
R0023      1) MARKSTAT CONTAINS MARK VALUE (BITS 14-12) AND VAC AREA ADDRESS
R0024      2) QPRET = VAC AREA POINTER VALUE
R0025      3) 1ST WORD OF RESERVED VAC AREA SET TO +0
R0026      4) PRIO32 PLACED IN A REGISTER

R0027   ERASABLE INITIALIZATION-
R0028      1) BITS 1-3 OF A = NO. MARKS REQUESTED
R0029      2) BITS 2,3 OF EXTVBACT =0
R0030      3) A VAC AREA MUST BE AVAILABLE (WORD 1 = ADDRESS OF VAC AREA)

R0031   DEBRIS-
R0032      A,Q,L,RUPTREG1,MARKSTAT,QPRET,BIT2 OF EXTVBACT

 0033                          13,2036                          BANK    13
 0034   REF   1                07,2000                          SETLOC  SXTMARKE
 0035                          07,2002                          BANK

 0036   REF   5  LAST  127     E7,1725                          EBANK=  MRKBUF1
 0037   REF   1                                                 COUNT   07/SXTMK

 0038                          07,2002  0 0004 0  SXTMARK  INHINT
 0039   REF  15  LAST  155     07,2003  54 070 1                TS      RUPTREG1       NUMBER OF MARKS WANTED

 0040   REF   6  LAST  182     07,2004  3 6211 0                CAF     SIX            BIT2 = MARKING SYSTEM IN USE
 0041   REF   4  LAST  187     07,2005  7 1044 1                MASK    EXTVBACT       BIT3 = EXTENDED VERB IN PROGRESS
 0042   REF  53  LAST  214     07,2006  10 000 0                CCS     A
 0043   REF   1                07,2007  0 2013 1                TC      MKABORT        SET THEREFORE ABORT
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0044   REF  18  LAST  164   07,2010  3 4711 1          CAF     BIT2          NOT SET
0045   REF   5  LAST  215   07,2011  27'044 1          ADS     EXTVBACT      SET IT, RESET IN ENDMARK
0046   REF   1              07,2012  0 2015 1          TC      MARKOK        YES, FIND VAC AREA

0047   REF   1              07,2013  0 5604 0  MKABORT TC      BAILOUT
0048                        07,2014   01211 1          OCT     01211
0049   REF   3  LAST  188   07,2015  10 400 1  MARKOK  CCS     VAC1USE       FIND VAC AREA
0050   REF   1              07,2016  0 2031 1          TC      MKVACFND
0051   REF   2  LAST  186   07,2017  10 454 0          CCS     VAC2USE
0052   REF   2  LAST  216   07,2020  0 2031 1          TC      MKVACFND
0053   REF   2  LAST  186   07,2021  10 530 0          CCS     VAC3USE
0054   REF   3  LAST  216   07,2022  0 2031 1          TC      MKVACFND
0055   REF   2  LAST  186   07,2023  10 604 1          CCS     VAC4USE
0056   REF   4  LAST  216   07,2024  0 2031 1          TC      MKVACFND
0057   REF   2  LAST  186   07,2025  10 660 0          CCS     VAC5USE
0058   REF   5  LAST  216   07,2026  0 2031 1          TC      MKVACFND
0059   REF   2  LAST  216   07,2027  0 5604 0          TC      BAILOUT
0060                        07,2030   01207 0          OCT     01207

0061   REF   1              07,2031  6 4711 1  MKVACFND AD     TWO           ADDRESS OF VAC AREA
0062   REF   2  LAST  187   07,2032  55'330 1          TS      MARKSTAT
0063   REF  54  LAST  215   07,2033  50 000 1          INDEX   A
0064   REF   1              07,2034  54 052 1          TS      QPRET         STORE NEXT AVAILABLE MARK SLOT
0065   REF  18  LAST  202   07,2035  3 4714 1          CAF     ZERO          SHOW VAC AREA OCCUPIED
0066   REF   3  LAST  216   07,2036  51'330 0          INDEX   MARKSTAT
0067                        07,2037  53'777 0          TS      0 -1

0068   REF   1              07,2040  0 5253 0          TC      CHECKMM       BACKUP MARK ROUTINE USES SXTMARK
0069                        07,2041   00065 1          MM      53
0070                        07,2042  1 2044 1          TCF     +2
0071   REF   1              07,2043  1 4570 0          TCF     SWRETURN
0072   REF   2  LAST  216   07,2044  0 5253 0          TC      CHECKMM
0073                        07,2045   00066 1          MM      54
0074                        07,2046  1 2050 1          TCF     +2
0075   REF   2  LAST  216   07,2047  1 4570 0          TCF     SWRETURN
0076   REF  11  LAST  197   07,2050  3 4677 0          CAF     BIT12         DESIRED NUMBER OF MARKS IN 12-14
0077                        07,2051  0 0006 1          EXTEND
0078   REF  16  LAST  215   07,2052  7 0070 1          MP      RUPTREG1
0079   REF  18  LAST  214   07,2053  56 001 0          XCH     L
0080   REF   4  LAST  216   07,2054  27'330 1          ADS     MARKSTAT

0081   REF   1              07,2055  3 7667 1          CAF     PRIO32        ENTER MARK JOB
0082   REF   2  LAST  131   07,2056  0 5027 1          TC      NOVAC
0083   REF   5  LAST  216      1330                    EBANK=  MARKSTAT
0084   REF   1              07,2057   02346 1          2CADR   MKVB51
0084   REF   1              07,2060   16062 1
0085                        07,2061  0 0003 1          RELINT
0086   REF   3  LAST  216   07,2062  1 4570 0          TCF     SWRETURN      SAME AS MODEEXIT
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R0087   PROGRAM NAME - MKRELEAS                          DATE- 5 APRIL 1967
R0088   PROGRAM MODIFIED BY 258/278 PROGRAMMERS          LOG SECTION SXTMARK
R0089   MOD BY- R. MELANSON TO ADD DOCUMENTATION        ASSEMBLY SUNDISK REV. 116

R0090   FUNCTIONAL DESCRIPTION-
R0091      MKRELEAS IS EXECUTED BY INTERNAL ROUTINES TO RELEASE THE MARK SYSTEM TO MAKE IT AVAILABLE TO OTHER INTERNAL
R0093      SYSTEM ROUTINES. IT ALSO CLEARS THE COARSE OPTICS FLAG BIT AND DISABLES THE OPTICS ERROR COUNTER.

R0095   CALLING SEQUENCE-

R0096      TC    BANKCALL
R0097      CADR MKRELEAS

R0098   NORMAL EXIT MODE-
R0099      SWRETURN

R0100   ALARM OR ABORT EXIT MODE- NONE

R0101   OUTPUT-
R0102      1) BITS OPTMODES SET TO 0
R0103      2) OPTIND SET TO -1
R0104      3) 1ST WORD OF VAC AREA SET TO VAC ADDRESS TO SIGNIFY AVAILABILITY.
R0105      4) MARKSTAT CLEARED
R0106      5) BIT2 CHANNEL 12 SET TO 0

R0107   ERASABLE INITIALIZATION- NONE

R0108   DEBRIS-
R0109      A,MARKSTAT,BIT9 OPTMODES,OPTIND,BIT2 CHANNEL 12

 0110   REF  19  LAST  216   07,2063  3 4714 1  MKRELEAS CAF    ZERO      SHOW MARK SYSTEM NOW AVAILABLE
 0111   REF   6  LAST  216   07,2064  57'330 0            XCH    MARKSTAT
 0112   REF  55  LAST  216   07,2065  10 000 0            CCS    A
 0113   REF  56  LAST  217   07,2066  50 000 1            INDEX  A
 0114                        07,2067  54 000 0            TS     0
 0115                        07,2070  0 0004 0  MKRLEES   INHINT
 0116   REF  16  LAST  158   07,2071  4 4702 1            CS     BIT9      COARSE OPTICS RETURN FLAG.
 0117   REF  31  LAST  182   07,2072  7 1331 0            MASK   OPTMODES
 0118   REF  32  LAST  217   07,2073  55'331 0            TS     OPTMODES

 0119   REF   6  LAST  198   07,2074  3 7716 0            CA     NEGONE
 0120   REF  17  LAST  198   07,2075  55'303 1            TS     OPTIND    KILL COARS OPTICS

 0121   REF  19  LAST  216   07,2076  4 4711 0            CS     BIT2      DISABLE OPTICS ERROR COUNTER
 0122                        07,2077  0 0006 1            EXTEND
 0123   REF  20  LAST  185   07,2100  03 012 1            WAND   CHAN12

 0124                        07,2101  0 0003 1            RELINT
 0125   REF   4  LAST  216   07,2102  0 4570 1            TC     SWRETURN
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R0126   PROGRAM NAME - MARKRUPT                          DATE- 5 APRIL 1967
R0127   PROGRAM MODIFIED BY 258/278 PROGRAMMERS         LOG SECTION SXTMARK
R0128   MOD BY- R. MELANSON TO ADD DOCUMENTATION        ASSEMBLY SUNDISK REV. 116

R0129   FUNCTIONAL DESCRIPTION-
R0130      MARKRUPT STORES CDUS,OPTICS AND TIME AND TRANSFERS CONTROL TO THE MARKIT,MARK REJECT OR KEYCOM ROUTINES IF
R0132      BITS IN CHANNEL 16 ARE SET AS REQUIRED.

R0133   CALLING SEQUENCE-
R0134      ROUTINE ENTERED VIA KEYRUPT2 WHEN MARK,MARK REJECT OR DSKY KEYS DEPRESSED BY THE OPERATOR.

R0136   NORMAL EXIT MODE-
R0137      MARKIT, MKREJECT OR POSTJUMP ROUTINES (MARK,MARK REJECT OR DSKY CODE)

R0138   ALARM OR ABORT EXIT MODE-
R0139      ALARM AND RESUME

R0140   OUTPUT-
R0141      RUPTSTOR+5 = CDUT, RUPTSTOR+3 = CDUS, RUPTSTOR+2 = CDUY,
R0142      RUPTREG3 = CDUZ, RUPTSTOR+6 = CDUX, RUPTSTOR+1 AND SAMPTIME+1 =TIME1,
R0143      RUPTSTOR AND SAMPTIME = TIME2

R0144   ERASABLE INITIALIZATION-
R0145      CDUT,CDUS,CDUY,CDUZ,CDUX,TIME2,TIME1,CHANNEL 16 BITS 6,7 OR 1-5

R0146   DEBRIS-
R0147      A,QRUPT,RUPTREG3,SAMPTIME,SAMPTIME+1,RUPTSTOR TO RUPTSTOR+6 EXCEPT RUPTSTOR+4 (LOCATION 67)

0149   REF   2  LAST  128   07,2103  54 016 1  MARKRUPT TS    BANKRUPT        STORE  CDUS AND OPTICS NOW
0150   REF   5  LAST  163   07,2104  3 0035 1           CA    CDUT
0151   REF   1              07,2105  54 362 1           TS    MKCDUT  -->
0152   REF   6  LAST  167   07,2106  3 0036 1           CA    CDUS
0153   REF   1              07,2107  54 360 C           TS    MKCDUS
0154   REF   1              07,2110  3 0033 1           CA    CDUY
0155   REF   1              07,2111  54 357 1           TS    MKCDUY
0156   REF   3  LAST  167   07,2112  3 0034 C           CA    CDUZ
0157   REF   1              07,2113  54 361 1           TS    MKCDUZ
0158   REF   2  LAST  167   07,2114  3 0032 C           CA    CDUX
0159   REF   1              07,2115  54 363 C           TS    MKCDUX
0160                        07,2116  0 0006 1           EXTEND
0161   REF   6  LAST  174   07,2117  3 0025 C           DCA   TIME2           GET TIME
0162   REF   1              07,2120  52 356 C           DXCH  MKT2T1
0163                        07,2121  0 0006 1           EXTEND
0164   REF   2  LAST  218   07,2122  3 0356 1           DCA   MKT2T1
0165   REF   1              07,2123  52 014 C           DXCH  SAMPTIME        RUPT TIME FOR NOUN 65.

0166   REF  22  LAST  214   07,2124  56 002 C           XCH   Q
0167   REF   2  LAST  128   07,2125  54 012 C           TS    QRUPT

0168   REF  24  LAST  194   07,2126  3 4705 1           CAF   BIT6            SEE IF MARK OR MKREJECT
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0169                              07,2127  0 0006 1           EXTEND
0170   REF   3  LAST  184         07,2130  02 016 1           RAND    NAVKEYIN
0171   REF  57  LAST  217         07,2131  10 000 C           CCS     A
0172   REF   1                    07,2132  0 2427 1           TC      MARKIT          ITS A MARK

0173   REF  23  LAST  196         07,2133  3 4704 C           CAF     BIT7            NOT A MARK, SEE IF MKREJECT
0174                              07,2134  0 0006 1           EXTEND
0175   REF   4  LAST  219         07,2135  02 016 1           RAND    NAVKEYIN
0176   REF  58  LAST  219         07,2136  10 000 C           CCS     A
0177   REF   1                    07,2137  0 2300 C           TC      MKREJECT        ITS A MARK REJECT

0178   REF   2  LAST  184         07,2140  3 4362 1  KEYCALL  CAF     OCT37           NOT MARK OR MKREJECT, SEE IF KEYCODE
0179                              07,2141  0 0006 1           EXTEND
0180   REF   5  LAST  219         07,2142  02 016 1           RAND    NAVKEYIN
0181                              07,2143  0 0006 1           EXTEND
0182                              07,2144  1 2147 C           BZF     +3              IF NO INBITS
0183   REF   6  LAST  195         07,2145  0 4574 C           TC      POSTJUMP
0184   REF   1                    07,2146   17622 1           CADR    KEYCOM          IT,S A KEY CODE, NOT A MARK.

0185   REF  12  LAST  193         07,2147  0 5537 C  +3       TC      ALARM           ALARM IF NO INBITS
0186                              07,2150   00113 1           OCT     113
0187   REF  18  LAST  164         07,2151  0 5222 C           TC      RESUME
```

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R0188   PROGRAM NAME - MARKCONT                          DATE- 19 SEPT 1967

R0189   PROGRAM MODIFIED BY 258/278 PROGRAMMERS          LOG SECTION SXTMARK
R0190   MOD BY- R. MELANSON TO ADD DOCUMENTATION    ASSEMBLY SUNDISK REV. 116

R0191   FUNCTIONAL DESCRIPTION-
R0192    MARKCONT IS USED TO PERFORM A SPECIAL MARK FUNCTION FOR R21, TO EXECUTE A SPECIAL DISPLAY OF OPTICS AND TIME OR
R0194      TO PERFORM A MARK OF A STAR OR LAND SIGHTING BASED UPON FLASHING V-N.

R0195   CALLING SEQUENCE-
R0196      FROM MARKDIF

R0197   NORMAL EXIT MODE-
R0198      TASKOVER

R0199   ALARM OR ABORT EXIT MODE-
R0200      ALARM AND TASKOVER

R0201   OUTPUT-
R0202      1) FOR R21-
R0203         EBANK=EBANK7
R0204         MRKBUF1 TO MRKBUF1+6 = TIME2,TIME1,CDUY,OPTICX,CDUZ,OPTICSY,CDUX OF CURRENT R21 MARK FUNCTION.
R0206         MRKBUF2 TO MRKBUF2+6 CONTAINS PREVIOUS R21 MARK VALUES.
R0207      2) FOR SPECIAL DISPLAY JOB-
R0208         RUPTREG1 AND MRKBUF1 = CDUS,RUPTREG2 AND MRKBUF1 +1 = CDUT,
R0209         RUPTREG3 AND MRKBUF1 +2 = TIME2,RUPTREG4 AND MRKBUF1 +3 = TIME1
R0210      3) FOR NORMAL MARKING-
R0211         DECREMENT BITS14-12 OF MARKSTAT BY 1,
R0212         BIT10 MARKSTAT SET TO 1,INCREMENT QPRET BY 7,
R0213         STORE TIME2,TIME1,CDUY,CDUS,CDUZ,CDUT AND CDUX IN VAC+1 TO VAC+7

R0214   ERASABLE INITIALIZATION-
R0215      1) FOR R21-
R0216         BIT14 OF STATE+2 =1, MRKBUF1 TO MRKBUF1+6, ITEMP1, RUPTREG3,
R0217         RUPTSTOR TO RUPTSTOR+6 EXCEPT RUPTSTOR+4
R0218      2) FOR SPECIAL DISPLAY JOB-
R0219         BIT14 OF STATE+2 =0,MARKSTAT =+C,RUPTREG1,RUPTREG2,RUPTREG3
R0220         RUPTREG4,RUPTSTOR,RUPTSTOR+1,RUPTSTOR+3,RUPTSTOR+5,
R0221         BIT12 OF STATE+5 (V59 FLAG),MRKBUF1 THRU MRKBUF1+3
R0222      3) FOR NORMAL MARKING-
R0223         BIT14 OF STATE+2 =0,MARKSTAT =VAC ADDRESS,A REG,ITEMP1,RUPTREG3,
R0224         RUPTSTOR TO RUPTSTOR+6 EXCEPT RUPTSTOR+4

R0225   DEBRIS-
R0226      1) FOR R21-
R0227         A,ITEMP1,MRKBUF1,MRKBUF2
R0228      2) FOR SPECIAL DISPLAY JOB-
R0229         A,RUPTREG1,RUPTREG2,RUPTREG3,RUPTREG4,MPAC TO MPAC+3
R0230      3) FOR NORMAL MARKING-
R0231         A,MARKSTAT,ITEMP1,QPRET,VAC+1 TO VAC+7 OF VAC AREA IN USE
```

```
0232   REF  23  LAST  187   07,2152  3 4675 1  MARKCONT CAF    BIT14
0233   REF  30  LAST  18C   07,2153  7 0076 1           MASK   STATE +2        R21 MARK (SPECIAL MARKING FOR R21)
0234                        07,2154  0 0006 1           EXTEND
0235   REF   1              07,2155  1 2167 1           BZF    MARKET         NOT SET THEREFORE REGULAR MARKING
0236   REF   7  LAST  215   07,2156  3 6211 C  MARKIT1  CAF    SIX            SPECIAL FOR R21
0237   REF   1              07,2157  0 5475 1           TC     GENTRAN        TRANSFER MRKBUF1 TO MRKBUF2
0238   REF   6  LAST  215   07,2160   01725 C           ADRES  MRKBUF1
0239   REF   9  LAST  206   07,2161   01734 C           ADRES  MRKBUF2

0240   REF   8  LAST  221   07,2162  3 6211 C           CAF    SIX             TRANSFER CURRENT MARK DATA TO MARKBUF1
0241   REF   2  LAST  221   07,2163  0 5475 1           TC     GENTRAN
0242   REF   3  LAST  218   07,2164   00355 1           ADRES  MKT2T1
0243   REF   7  LAST  221   07,2165   01725 C           ADRES  MRKBUF1

0244   REF   4  LAST  159   07,2166  1 5213 C           TCF    TASKOVER

0245   REF   7  LAST  217   07,2167  11'330 1  MARKET   CCS    MARKSTAT        SEE IF MARKS CALLED FOR
0246   REF   1              07,2170  0 2224 1           TC     MARK2           COLLECT MARKS

0247   REF   9  LAST  221   07,2171  3 6211 C           CAF    SIX
0248   REF   3  LAST  221   07,2172  0 5475 1           TC     GENTRAN         TRANSFER MARK DATA TO MARKDOWN
0249   REF   4  LAST  221   07,2173   00355 1           ADRES  MKT2T1
0250   REF   6  LAST  17C   07,2174   01674 C           ADRES  MARKDOWN

0251   REF  10  LAST  221   07,2175  3 6211 C           CAF    SIX
0252   REF   4  LAST  221   07,2176  0 5475 1           TC     GENTRAN         TRANSFER MARK DATA TO MRKBUF1 FOR
0253   REF   5  LAST  221   07,2177   00355 1           ADRES  MKT2T1          SPECIAL DISPLAY OF SHAFT AND TRUNION
0254   REF   8  LAST  221   07,2200   01725 C           ADRES  MRKBUF1         IF V59 ACTING

0255   REF   2  LAST  216   07,2201  3 4711 1           CAF    TWO             IS MARKING SYSTEM IN USE (BIT2)
0256   REF   6  LAST  216   07,2202  7 1044 1           MASK   EXTVBACT
0257                        07,2203  0 0006 1           EXTEND
0258   REF   1              07,2204  1 2216 1           BZF    MARKET3         MARKING NOT CALLED FOR
0259   REF  12  LAST  216   07,2205  3 4677 C           CAF    BIT12
0260   REF  31  LAST  221   07,2206  7 0101 C           MASK   STATE +5        V59FLAG
0261                        07,2207  0 0006 1           EXTEND
0262   REF   2  LAST  221   07,2210  1 2216 1           BZF    MARKET3         IF V59FLAG NOT SET-MARK UNCALLED FOR
0263   REF   2  LAST  195   07,2211  3 4754 C           CAF    PRIO5           CALIBRATION MARK (SET) FOR P23
0264   REF   3  LAST  216   07,2212  0 5027 1           TC     NOVAC           SPECIAL DISPLAY JOB
0265   REF   9  LAST  221   E7,1725                     EBANK= MRKBUF1
0266   REF   1              07,2213   02405 1           2CADR  MARKDISP
0266   REF   1              07,2214   76067 1

0267   REF   5  LAST  221   07,2215  1 5213 C           TCF    TASKOVER
0268   REF  13  LAST  219   07,2216  0 5537 C  MARKET3   TC     ALARM
0269                        07,2217   00122 C           OCT    122             MARKING NOT CALLED FOR
0270   REF   6  LAST  221   07,2220  1 5213 C           TCF    TASKOVER
0271   REF  14  LAST  221   07,2221  0 5537 C  114ALM    TC     ALARM           MARK NOT WANTED
0272                        07,2222   00114 C           OCT    114
0273   REF   7  LAST  221   07,2223  1 5213 C           TCF    TASKOVER
```

P0274 STORE MARK DATA IN MKVAC AND INCREMENT POINTER

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0275  REF   1                07,2224  6 7711 1  MARK2   AD      74K       SEE IF MARKS WANTED-REDUCE MARKS WANTED
0276                         07,2225  0 0006 1           EXTEND
0277  REF   1                07,2226  6 2221 1           BZMF    114ALM    MARK NOT WANTED-ALARM
0278  REF   8  LAST  221      07,2227  55'330 1           TS      MARKSTAT
0279                         07,2230  4 0000 C           COM
0280  REF  16  LAST  161      07,2231  7 4701 1           MASK    BIT10     SET BIT10 TO ENABLE REJECT
0281  REF   9  LAST  222      07,2232  27'330 1           ADS     MARKSTAT

0282  REF   1                07,2233  7 4741 C           MASK    LOW9
0283  REF   7  LAST  163      07,2234  54 061 1           TS      ITEMP1
0284  REF  59  LAST  219      07,2235  50 000 1           INDEX   A
0285  REF   2  LAST  216      07,2236  56 052 C           XCH     QPRET     PICK UP MARK SLOT-POINTER
0286  REF   3  LAST   65      07,2237  54 062 1           TS      ITEMP2    SAVE CURRENT POINTER
0287  REF   3  LAST  158      07,2240  6 4716 C           AD      SEVEN     INCREMENT POINTER
0288  REF   8  LAST  222      07,2241  50 061 C           INDEX   ITEMP1
0289  REF   3  LAST  222      07,2242  54 052 1           TS      QPRET     STORE ADVANCED POINTER

0290                         07,2243  0 0006 1  VACSTOR  EXTEND
0291  REF   6  LAST  221      07,2244  3 0356 1           DCA     MKT2T1
0292  REF   4  LAST  222      07,2245  50 062 C           INDEX   ITEMP2
0293                         07,2246  52 001 1           DXCH    0
0294  REF   2  LAST  216      07,2247  3 0357 C           CA      MKCDUY
0295  REF   5  LAST  222      07,2250  50 062 C           INDEX   ITEMP2
0296                         07,2251  54 002 1           TS      2
0297  REF   2  LAST  218      07,2252  3 0360 1           CA      MKCDUS
0298  REF   6  LAST  222      07,2253  50 062 C           INDEX   ITEMP2
0299                         07,2254  54 003 C           TS      3
0300  REF   2  LAST  218      07,2255  3 0361 C           CA      MKCDUZ
0301  REF   7  LAST  222      07,2256  50 062 C           INDEX   ITEMP2
0302                         07,2257  54 004 1           TS      4
0303  REF   2  LAST  218      07,2260  3 0362 C           CA      MKCDUT
0304  REF   8  LAST  222      07,2261  50 062 C           INDEX   ITEMP2
0305                         07,2262  54 005 C           TS      5
0306  REF   2  LAST  218      07,2263  3 0363 1           CA      MKCDUX
0307  REF   9  LAST  222      07,2264  50 062 C           INDEX   ITEMP2
0308                         07,2265  54 006 C           TS      6

0309  REF   1                07,2266  3 7671 C           CAF     PRIO34    IF ALL MARKS MADE FLASH V850
0310  REF  10  LAST  222      07,2267  7 1330 1           MASK    MARKSTAT
0311                         07,2270  0 0006 1           EXTEND
0312                         07,2271  1 2273 1           BZF     +2
0313  REF   8  LAST  221      07,2272  1 5213 C           TCF     TASKOVER
0314  REF   2  LAST  216      07,2273  3 7667 1           CAF     PRIO32
0315  REF   4  LAST  221      07,2274  0 5027 1           TC      NOVAC
0316  REF  11  LAST  222         1330                    EBANK=  MARKSTAT
0317  REF   1                07,2275   02421 1           2CADR   MKVB50
0317  REF   1                07,2276   16062 1
0318  REF   9  LAST  222      07,2277  1 5213 C           TCF     TASKOVER
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R0319   PROGRAM NAME - MKREJECT                          DATE- 5 APRIL 1967
R0320   PROGRAM MODIFIED BY 258/278 PROGRAMMERS         LOG SECTION SXTMARK
R0321   MOD BY- R. MELANSON TO ADD DOCUMENTATION    ASSEMBLY SUNDISK REV. 116

R0322   FUNCTIONAL DESCRIPTION-
R0323      ROUTINE ALLOWS OPERATOR TO REJECT MARK MADE PRIOR TO ACCEPTANCE AND ALLOWS A NEW MARK TO BE MADE BY ASTRONAUT

R0325   CALLING SEQUENCE-
R0326      FROM MARKRUPT IF BIT7 OF CHANNEL 16 IS 1.

R0327   NORMAL EXIT MODE-
R0328      RESUME

R0329   ALARM OR ABORT EXIT MODE-
R0330      ALARM AND RESUME

R0331   OUTPUT-
R0332      1) FOR R21-
R0333         MRKBUF1 SET TO -1
R0334      2) FOR NORMAL MARKING-
R0335         BIT10 MARKSTAT =0,INCREMENT NO. MARKS BY 1,DECREMENT QPRET BY 7

R0336   ERASABLE INITIALIZATION-
R0337      1) FOR R21-
R0338         BIT14 OF STATE+2 SET TO 1
R0339      2) FOR NORMAL MARKING-
R0340         BIT14 OF STATE+2 SET TO 0,MARKSTAT,QPRET

R0341   DEBRIS-
R0342      1) FOR R21-
R0343         A,MARKSTAT,EBANK
R0344      2) FOR NORMAL MARKING-
R0345         A,MARKSTAT,ITEMP1,QPRET

 0346   REF  24  LAST  221   07,2300  3 4675 1  MKREJECT CAF   BIT14
 0347   REF  32  LAST  221   07,2301  7 0076 1           MASK  STATE +2      R21 MARK (SPECIAL MARKING FOR R21)
 0348                        07,2302  0 0006 1           EXTEND
 0349   REF   1              07,2303  1 2307 0           BZF   MRKREJCT      NOT SET THEREFORE REGULAR REJECT
 0350   REF   7  LAST  217   07,2304  3 7716 0           CA    NEGONE        -1 (FOR R22)
 0351   REF  10  LAST  221   07,2305  55'725 1           TS    MRKBUF1       -0 IN TIME IS FLAG TO R22 SIGNIFYING A
 0352   REF  19  LAST  219   07,2306  0 5222 0           TC    RESUME        REJECTED MARK
 0353   REF  12  LAST  222   07,2307  11'330 1  MRKREJCT CCS   MARKSTAT     SEE IF MARKS BEING ACCEPTED
 0354   REF   1              07,2310  0 2314 0           TC    REJECT2
 0355   REF  15  LAST  221   07,2311  0 5537 0           TC    ALARM         MARKS NOT BEING ACCEPTED
 0356                        07,2312   00112 0           OCT   112
 0357   REF  20  LAST  223   07,2313  0 5222 0           TC    RESUME

 0358   REF  17  LAST  222   07,2314  4 4701 1  REJECT2  CS    BIT10         SEE IF MARK HAD BEEN MADE SINCE LAST
 0359   REF  13  LAST  223   07,2315  7 1330 1           MASK  MARKSTAT      REJECT, AND SET BIT10 TO ZERO TO
 0360   REF  14  LAST  223   07,2316  57'330 0           XCH   MARKSTAT      SHOW MARK REJECT
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0361   REF  18  LAST  223   07,2317  7 4701 1          MASK    BIT10
0362   REF  60  LAST  222   07,2320  10 000 0          CCS     A
0363   REF   1               07,2321  0 2325 1          TC      REJECT3

0364   REF  16  LAST  223   07,2322  0 5537 0          TC      ALARM          DONT ACCEPT TWO REJECTS TOGETHER
0365                         07,2323   00110 1          OCT     110
0366   REF  21  LAST  223   07,2324  0 5222 0          TC      RESUME

0367   REF   2  LAST  222   07,2325  3 4741 1  REJECT3 CAF     LOW9           DECREMENT POINTER TO REJECT MARK
0368   REF  15  LAST  223   07,2326  7 1330 1          MASK    MARKSTAT
0369   REF   9  LAST  222   07,2327  54 061 1          TS      ITEMP1
0370   REF   4  LAST  222   07,2330  4 4716 1          CS      SEVEN
0371   REF  10  LAST  224   07,2331  50 061 0          INDEX   ITEMP1
0372   REF   4  LAST  222   07,2332  26 052 1          ADS     QPRET          NEW POINTER

0373   REF  13  LAST  221   07,2333  3 4677 0          CAF     BIT12          INCREMENT MARKS WANTED AND IF FIELD
0374   REF  16  LAST  224   07,2334  6 1330 0          AD      MARKSTAT       IS NOW NON-ZERO, CHANGE TO VB51 TO
0375   REF  17  LAST  224   07,2335  57'330 0          XCH     MARKSTAT       INDICATE MORE MARKS WANTED
0376   REF   2  LAST  222   07,2336  7 7671 1          MASK    PRIO34         INDICATE MORE MARKS WANTED
0377   REF  61  LAST  224   07,2337  10 000 0          CCS     A
0378   REF  22  LAST  224   07,2340  0 5222 0          TC      RESUME
0379   REF   3  LAST  222   07,2341  3 7667 1          CAF     PRIO32
0380   REF   5  LAST  222   07,2342  0 5027 1          TC      NOVAC
0381   REF  18  LAST  224      1330                    EBANK=  MARKSTAT
0382   REF   2  LAST  216   07,2343   02346 1          2CADR   MKVB51
0382                         07,2344   16062 1
0383   REF  23  LAST  224   07,2345  0 5222 0          TC      RESUME
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R0384   PROGRAM DESCRIPTION MKV851 AND MKV850

R0385   AUTHOR-BARNERT DATE-2-15-67 MOD-0
R0386   PURPOSE  FLASH V51N70,V51N43, OR V51 TO REQUEST MARKING,
R0387            AND V50N25 R1=16 TO REQUEST TERMINATE MARKING

R0388   CALLING SEQUENCE   AS JOB WITHIN SXTMARK

R0389   EXIT TO ENDMARK UPON RECEIPT OF V33, V34 CAUSES GOTOPOOH, ENTER
R0390            RECYCLES THE DISPLAY

R0391   NOTE- SXTMARK AUTOMATICALLY CHANGES FROM CALLING MKV851 TO MKV850 WHEN
R0392            SUFFICIENT MARKS HAVE BEEN MADE, AND THE REVERSE WHEN A MARK
R0393            REJECT REDUCES THE NUMBER MADE BELOW THAT REQUIRED

R0394   SUBROUTINES CALLED- BANKCALL, GOMARK2,GOODEND,ENDMARK,WAITLIST

R0395   ALARM OR ABORT MODES - NONE

R0396   ERASABLE USED-VERBREG,MARKSTAT,QPRET,CSTEM1

R0397   OUTPUT  MARKSTAT=VAC ADDRESS

R0398           QPRET=   NO.MARKS
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0401   REF   7  LAST  198  07,2346  0 4555 0  MKV851  TC     BANKCALL   CLEAR DISPLAY FOR MARK VERB
0402   REF   1             07,2347   20464 0           CADR   KLEENEX
0403   REF   1             07,2350  3 2426 0           CAF    V851       DISPLAY MARK V851
0404   REF   8  LAST  225  07,2351  0 4555 0           TC     BANKCALL
0405   REF   1             07,2352   20476 0           CADR   GOMARK4
0406   REF   1             07,2353  1 2356 1           TCF    TERMSXT    V834-TERMINATE
0407   REF   1             07,2354  1 2367 0           TCF    ENTANSWR   V33-PROCEED-MARKING DONE
0408   REF   1             07,2355  1 2415 1           TCF    MKV85X     ENTER-RECYCLE TO INITIAL MARK DISPLAY

0409   REF   2  LAST  198  07,2356  0 5425 1  TERMSXT  TC     CLEARMRK   CLEAR MARK ACTIVITY.

04095  REF   3  LAST  216  07,2357  0 5253 0           TC     CHECKMM
0410                       07,2360   00003 1           MM     03
0411                       07,2361  1 2363 1           TCF    +2
0412   REF   1             07,2362  0 2365 0           TC     TERMP03
0414   REF   7  LAST  219  07,2363  0 4574 0           TC     POSTJUMP
04145  REF   1             07,2364   30176 1           CADR   TERM52

04146  REF   2  LAST  198  07,2365  0 5435 0  TERMP03  TC     UPFLAG
04147  REF   1             07,2366   00032 0           ADRES  TRM03FLG
0415   REF   3  LAST  224  07,2367  3 4741 1  ENTANSWR CAF    LOW9       PUT VAC ADR IN MARKSTAT AND NO. OF
0416   REF  19  LAST  224  07,2370  7 1330 1           MASK   MARKSTAT   MARKS MADE IN QPRET BEFORE LEAVING
0417   REF  20  LAST  225  07,2371  55'330 1           TS     MARKSTAT   SXTMARK
0418                       07,2372  4 0000 0           COM
0419   REF  21  LAST  225  07,2373  51'330 0           INDEX  MARKSTAT
0420   REF   5  LAST  224  07,2374  6 0052 0           AD     QPRET
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0421                          07,2375  0 0006 1          EXTEND
0422  REF   1                 07,2376  6 2402 0          BZMF    JAMIT          NO MARKS MADE, SHOW IT IN QPRET, R53
0423                          07,2377  0 0006 1          EXTEND                   WILL PICK IT UP AND RECYCLE
0424  REF  14  LAST  224      07,2400  7 4677 1          MP      BIT12          THIS PUTS NUMBER MARKS-1 IN A
0425  REF   8  LAST  163      07,2401  6 4712 1          AD      ONE
0426  REF  22  LAST  225      07,2402  51'330 0  JAMIT    INDEX   MARKSTAT       STORE NO OF MARKS MADE
0427  REF   6  LAST  225      07,2403  54 052 1          TS      QPRET
0434                          07,2404  0 0004 0          INHINT                   SERVICE OPTSTALL INTERFACE WITH
0435  REF   4  LAST  195      07,2405  3 4715 0          CAF     FIVE
0436  REF   7  LAST  182      07,2406  0 5140 1          TC      WAITLIST
0437  REF  23  LAST  226        1330                    EBANK=  MARKSTAT
0438  REF   1                 07,2407    02412 1        2CADR   ENDMARKS
0438  REF   1                 07,2410    16062 1
0439  REF   1                 07,2411  0 5423 1          TC      ENDMARK        KNOCKS DOWN MARKING FLAG + DOES ENDOFJOB

0440  REF   9  LAST  226      07,2412  3 4712 1  ENDMARKS CAF     ONE
0441  REF  16  LAST  195      07,2413  0 4633 0          TC      IBNKCALL
0442  REF   1                 07,2414    17467 1        CADR    GOODEND
0443  REF   3  LAST  224      07,2415  3 7671 0  MKVB5X   CAF     PRIO34
0444  REF  24  LAST  226      07,2416  7 1330 1          MASK    MARKSTAT       RE-DISPLAY VB51 IF MORE MARKS WANTED
0445  REF  62  LAST  224      07,2417  10 000 0          CCS     A              AND VB50 IF ALL IN
0446  REF   3  LAST  224      07,2420  1 2346 0          TCF     MKVB51
0447  REF   1                 07,2421  3 4333 0  MKVB50   CAF     R1D1           OCT 16
0448  REF   2  LAST   73      07,2422  55'045 0          TS      DSPTEM1
0449  REF   1                 07,2423  3 2425 0          CAF     V50N25
0450  REF   4  LAST  226      07,2424  1 2351 0          TCF     MKVB51 +3

0451                          07,2425    14431 1  V50N25   VN      5025
0452                          07,2426    14600 1  VB51     VN      5100
0454  REF   1                   4362                   OCT37   =       LOW5

R0455  PROGRAM NAME - MARKIT                                  DATE- 19 SEPT 1967

R0456  CALLING SEQUENCE
R0457     FROM MARKRUPT IF CHAN 16 BIT 6 = 1

R0458  EXIT
R0459     RESUME

R0460  INPUT
R0461     CDUCHKWD. ALSO ALL INITIALIZATION FOR MARKCONT

R0462  OUTPUT
R0463     MK12T1,MKCDUX,MKCDUY,MKCDUZ,MKCDUS,MKCOUT

R0464  ALARM EXIT
R0465     NONE

0466  REF   1                 07,2427  11'341 1  MARKIT   CCS     CDUCHKWD
0467                          07,2430  1 2433 0          TCF     +3             DELAY OF CDUCHKWD CS IF PNZ
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0468                                07,2431  1 2433 C          TCF     +2
0469   REF  20  LAST  217           07,2432  3 4714 1          CAF     ZERO
0470   REF  10  LAST  226           07,2433  6 4712 1          AD      ONE             10 MS IF NO CHECK
0471   REF   8  LAST  226           07,2434  0 5140 1          TC      WAITLIST
0472   REF  11  LAST  223           E7,1725                    EBANK=  MRKBUF1
0473   REF   1                      07,2435   02203 1          2CADR   MARKDIF
0473   REF   1                      07,2436   20067 1
0474   REF  24  LAST  224           07,2437  1 5222 1          TCF     RESUME

0475   REF   1                      10,2000                    SETLOC  SXTMARK1
0476                                10,2203                    BANK

0477   REF   1                                                 COUNT   10/SXTMK

R0478  PROGRAM NAME - MARKDIF                          DATE- 19 SEPT 1967

R0479  CALLING SEQUENCE
R0480     WAITLIST FROM MARKIT

R0481  EXIT
R0482     TASKOVER OT IBNKCALL TO MARKCONT

R0483  INPUT
R0484     OUTPUT FROM MARKIT, INPUT TO MARKCONT, COUCHKWD

R0485  OUTPUT
R0486     RUPTSTOR - RUPTSTOR+3,RUPTREG3,RUPTSTOR+5 - RUPTSTOR +6

R0487  ALARM EXIT
R0488     ALARM AND TASKOVER

0489   REF   2  LAST  226  10,2203  3 1341 C  MARKDIF  CA      COUCHKWD        IF DELAY CHECK IS ZERO OR NEG,ACP MARK
0490                       10,2204  0 0006 1            EXTEND
0491   REF   1             10,2205  6 2216 C            BZMF    MKACPT
0492   REF  26  LAST  199  10,2206  4 4712 C            CS      BIT1
0493   REF   1             10,2207  54 354 1            TS      MKNDX           SET INDEX -1
0494   REF   3  LAST  222  10,2210  3 0363 1            CA      MKCDLX
0495   REF   1             10,2211  0 2220 C            TC      DIFCHK          SEE IF VEHICLE RATE  TO MUCH AT MARK
0496   REF   3  LAST  222  10,2212  3 0357 C            CA      MKCDLY
0497   REF   2  LAST  227  10,2213  0 2220 C            TC      DIFCHK
0498   REF   3  LAST  222  10,2214  3 0361 C            CA      MKCDLZ
0499   REF   3  LAST  227  10,2215  0 2220 C            TC      DIFCHK

0500   REF  17  LAST  226  10,2216  0 4633 C  MKACPT    TC      IBNKCALL
0501   REF   1             10,2217   16152 C            CADR    MARKCONT        MARK DATA OK, WHAT DO WE DO WITH IT

0503   REF   2  LAST  227  10,2220  24 354 C  DIFCHK    INCR    MKNDX           INCREMENT INDEX

0504                       10,2221  0 0006 1            EXTEND
0505   REF   3  LAST  227  10,2222  5 0354 C            INDEX   MKNDX
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0506   REF   3  LAST  218   10,2223  20 032 1        MSU     CDUX          GET MARK(ICDU) - CURRENT(ICDU)
0507   REF  63  LAST  226   10,2224  10 000 0        CCS     A
0508                        10,2225  1 2231 1        TCF     +4
0509   REF  23  LAST  218   10,2226  0 0002 0        TC      Q
0510                        10,2227  1 2231 1        TCF     +2
0511   REF  24  LAST  228   10,2230  0 0002 0        TC      Q
0512   REF   1              10,2231  6 7715 0        AD      NEG2          SEE IF DIFFERENCE GREATER THAN 3 BITS
0513                        10,2232  0 0006 1        EXTEND
0514                        10,2233  6 2230 1        BZMF    -3            NOT GREATER

0518   REF  17  LAST  224   10,2234  0 5537 0        TC      ALARM         COUPLED WITH PROGRAM ALARM
0519                        10,2235   00121 0        OCT     00121

0520   REF  10  LAST  222   10,2236  1 5213 0        TCF     TASKOVER      DO NOT ACCEPT
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 0001                          C7,2440                    BANK   7
 0002   REF   1                43,2000                    SETLOC EXTVERBS
 0003                          43,2000                    BANK

 0004   REF   4  LAST  207     E5,1757                    EBANK= OGC

 0005   REF   1                                           COUNT* $$/EXTVB
RC0006  FAN-OUT

 0007   REF  24  LAST  198     43,2000   50 154 1  GOEXTVB  INDEX  MPAC      VERB-40 IS IN MPAC
 0008   REF   1                43,2001   0 2002 1          TC     LST2FAN    FAN AS BEFORE.

 0009   REF   1                43,2002   0 2130 1  LST2FAN  TC     VBZERO     V840 ZERO (USED WITH NOUN 20 ONLY).
 0010   REF   1                43,2003   0 2154 0          TC     VBCOARK    V841 COARSE ALIGN (USED WITH NOUN 20 OR
A0011                                                                          91 ONLY)
 0012   REF   1                43,2004   0 2244 1          TC     IMUFINEK   V842 FINE ALIGN IMU
 0013   REF   1                43,2005   0 2416 0          TC     IMUATTCK   V843  LOAD IMU ATTITUDE ERROR METERS.
 0014   REF   1                43,2006   0 3202 1          TC     SETSURF    V844 SET SURFACE FLAG
 0015   REF   1                43,2007   0 3205 0          TC     RESTSRF    V845 RESET SURFACE FLAG
 0016   REF   1                43,2010   0 2522 0          TC     STABLISH   V846 ESTABLISH G+C CONTROL.
 0017   REF   1                43,2011   0 3100 0          TC     LMTOCMSV   V847 MOVE LM STATE VECTOR INTO CM
 0018   REF   1                43,2012   0 2541 0          TC     DAPDISP    V848 LOAD A/P DATA.
 0019   REF   1                43,2013   1 2533 1          TCF    CREWMANU   V8 49  START AUTOMATIC ATTITUDE MANEUVER
 0020   REF   1                43,2014   0 2301 1          TC     GOLOADLV   V850 PLEASE PERFORM
 0021   REF   2  LAST  229     43,2015   0 2301 1          TC     GOLOADLV   V851 PLEASE MARK
 0022   REF   1                43,2016   0 3153 0          TC     V52        V852 SET OFFSET NO. FOR P22
 0023   REF   3  LAST  229     43,2017   0 2301 1          TC     GOLOADLV   V8 53 PLEASE PERFORM COAS MARK
 0024   REF   1                43,2020   0 2601 1          TC     GOTOR23    V54 START R23 (R21-BACKUP)
 0025   REF   1                43,2021   0 2332 1          TC     ALINTIME   V855 ALIGN TIME
 0026   REF   1                43,2022   0 2642 0          TC     TRACKTRM   V856 TERMINATE TRACKING (P20 +P25)
 0027   REF   1                43,2023   0 2576 1          TC     GOTOR21    V57 START R21 REND TRACK SIGHT MARK ROUT
 0028   REF   1                43,2024   0 2506 0          TC     ENATMA     V858 ENABLE AUTOMATIC ATTITUDE MANEUVER
 0029   REF   4  LAST  229     43,2025   0 2301 1          TC     GOLOADLV   V859 PLEASE CALIBRATE
 0030   REF   1                43,2026   0 2307 1          TC     V60        V860 SET CPHIX (N17) EQUAL TO CDU
 0031   REF   1                43,2027   0 2315 1          TC     V61        V861 SELECT MODE I
 0032   REF   1                43,2030   0 2320 1          TC     V62        V862 SELECT MODE II, ERROR WRT N22
 0033   REF   1                43,2031   0 2325 1          TC     V63        V863 SELECT MODE III, ERROR WRT N17
 0034   REF   1                43,2032   0 2476 0          TC     V864       V864 CALCULATE,DISPLAY S-BAND ANT ANGLES
 0035   REF   1                43,2033   0 2373 1          TC     CKOPTVB    V 65 E OPTICAL VERIFICATION FOR PRELAUNC
 0036   REF   1                43,2034   0 3032 0          TC     ATTACHED   V8 66 ATTACHED. MOVE THIS TO OTHER STATE
 0037   REF   1                43,2035   0 3174 0          TC     V67        V867 WMATRIX MONITOR
 0038   REF   1                43,2036   0 2511 0          TC     STROKON    V868 CSM STROKE TEST ON.
 0039   REF   1                43,2037   0 2037 1  VERB69   TC     VERB69     V8 69 CAUSE RESTART
 0040   REF   1                43,2040   0 3721 0          TC     V70UPDAT   V870 UPDATE LIFTOFF TIME.
 0041   REF   1                43,2041   0 3723 1          TC     V71UPDAT   V871 UNIVERSAL UPDATE - BLOCK ADDRESS.
 0042   REF   1                43,2042   0 3725 1          TC     V72UPDAT   V872 UNIVERSAL UPDATE - SINGLE ADDRESS.
 0043   REF   1                43,2043   0 3727 0          TC     V73UPDAT   V873 UPDATE AGC TIME (OCTAL).
 0044   REF   1                43,2044   0 2710 0          TC     DNEDUMP    V874 INITIALIZE DOWN-TELEMETRY PROGRAM
A0045                                                                          FOR ERASABLE DUMP.
 0046   REF   1                43,2045   0 2714 1          TC     LFTFLGON   V875 SET LIFTOFF FLAG.
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0047   REF   1                 43,2046   0 3013 C          TC     SETPRFLG   V876 SET PREFERRED ATTITUDE FLAG
0048   REF   1                 43,2047   0 3016 C          TC     RESETPRF   V877 RESET PREFERRED ATT. FLAG
0049   REF   1                 43,2050   0 2404 C          TC     CHAZFDGC   CHANGE GYROCOMPASS LAUNCH AZIMUTH V78
0050   REF   1                 43,2051   0 3004 C          TC     CALLR35    V879 REQU LUNAR LNDMRK SELECTION (R35)
0051   REF   1                 43,2052   0 2702 C          TC     LEMVEC     V880 UPDATE LEM STATE VECTOR
0052   REF   1                 43,2053   0 2705 1          TC     CSMVEC     V881 UPDATE CSM STATE VECTOR
0053   REF   1                 43,2054   0 2551 1          TC     V82PERF    V882 REQUEST CRBIT PARAM DISPLAY (R30)
0054   REF   1                 43,2055   0 2556 C          TC     V83PERF    V883 RANGE, RANGE RATE, +X AXIS  (R31)
0055   REF   1                 43,2056   0 2124 1          TC     ALM/END    V84 SPARE
0056   REF   1                 43,2057   0 2570 1          TC     V85PERF    V885 RANGE, RANGE RATE, SLOS     (R34)
0057   REF   1                 43,2060   0 2635 C          TC     V86PERF    V886 BACKUP MARK REJECT
0058   REF   1                 43,2061   0 3021 1          TC     SETVHFLG   V887 SET VHF RANGE FLAG
0059   REF   1                 43,2062   0 3025 C          TC     RESETVHF   V888 RESET VHF RANGE FLAG
0060   REF   1                 43,2063   0 2734 C          TC     V89PERF    V89-ALIGN X OR PRF CSM AXIS TO LOS (R63)
0061   REF   1                 43,2064   0 3140 1          TC     V90PERF    V890-CUT OF PLANE PARAMETERS "R36"
0062   REF   1                 43,2065   0 2751 C          TC     GOSHCSUM   V891 TEMP FOR HYBRID AND STG.
0063   REF   1                 43,2066   0 2364 1          TC     SYSTEST    V892 OPERATE IMU PERFORMANCE TEST
0064   REF   1                 43,2067   0 2744 1          TC     WMATRXNG   V893 CLEAR RENDWFLG
0065   REF   1                 43,2070   0 3124 C          TC     VERB94     V894 DO R64
0066   REF   2  LAST  230      43,2071   0 2124 1          TC     ALM/END    V895 SPARE
0067   REF   1                 43,2072   1 3146 C          TCF    VERB96     V896 SET QUITFLAG TO STOP INTEGRATION
0068   REF   5  LAST  229      43,2073   0 2301 1          TC     GOLOADLV   V97 PLEASE PERFORM ENGINE-FAIL (R41)
0069   REF   3  LAST  230      43,2074   0 2124 1          TC     ALM/END    V898 SPARE
0070   REF   6  LAST  230      43,2075   0 2301 1          TC     GOLOADLV   V899 PLEASE ENABLE ENGINE

R0071  END OF EXTENDED VERB FAN

0072   REF   7  LAST  221      43,2076  11'044 1  TESTXACT CCS    EXTVBACT
0073   REF   4  LAST  230      43,2077   0 2124 1          TC     ALM/END    YES. TURN ON OPERATOR ERROR LIGHT
00731  REF   2  LAST  187      43,2100   3 0100 C          CA     FLAGWRD4   ARE PRIOS USING DSKY
00732  REF   1                 43,2101   7 2127 C          MASK   OC2410     
00733  REF   64 LAST  228      43,2102  10 000  C          CCS    A          
00734  REF   5  LAST  230      43,2103   0 2124 1          TC     ALM/END    

0074   REF   3  LAST  195      43,2104   3 4112 1          CAF    OCT24      SET BITS 3 AND 5
0075   REF   8  LAST  230      43,2105  55'044 1  SETXTACT TS     EXTVBACT   NO. SET FLAG TO SHOW EXT VERB DISPLAY
A0076                                                                       SYSTEM BUSY

0077   REF   25 LAST  228      43,2106   3 0002 C          CA     Q          
0078   REF   25 LAST  229      43,2107  54 155  1          TS     MPAC +1    

0079   REF   3  LAST  221      43,2110   3 4754 C          CAF    PRIO5      ALLOW RELDSP AWAKENED JOB TO FINISH
0080   REF   1                 43,2111   0 5103 C          TC     PRIOCHNG   
0081   REF   4  LAST  192      43,2112   3 4371 C          CAF    PRIO30     
0082   REF   2  LAST  230      43,2113   0 5103 C          TC     PRIOCHNG   

0083   REF   3  LAST  221      43,2114   4 4711 C          CS     TWO        BLANK EVERYTHING EXCEPT MM AND VERB
0084   REF   1                 43,2115   0 4170 C          TC     NVSUB      
0085                           43,2116   0 2117 1          TC     +1         
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0086  REF  26  LAST  230   43,2117  0 0155 0            TC     MPAC +1

0087  REF   2  LAST  196   43,2120  0 4400 1  XACTALM   TC     FALTON          TURN ON OPERATOR ERROR LIGHT.
0088  REF   1               43,2121  0 5423 1            TC     ENDEXT          RELEASE MARK AND EXT. VERB DISPLAY SYS.

0089  REF   2  LAST  231      5423                TERMEXTV EQUALS ENDEXT
0090  REF   3  LAST  231      5423                ENDEXTVB EQUALS ENDEXT

0091  REF  21  LAST  227   43,2122  3 4714 1  XACTO     CAF    ZERO            RELEASE MARK AND EXT. VERB DISPLAY SYS.
0092  REF   1               43,2123  0 2105 1            TC     SETXTACT

0093  REF   3  LAST  231   43,2124  0 4400 1  ALM/END   TC     FALTON          TURN ON OPERATOR ERROR LIGHT
0094  REF   8  LAST  225   43,2125  0 4574 0  GOPIN     TC     POSTJUMP
0095  REF   2  LAST  193   43,2126    21176 1            CADR   PINBRNCH

00955                       43,2127   24100 0  OC24100   OCT    24100
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```
P0096              VEZERO      VERB 40          DESCRIPTION
R0097                  ZERO
R0098                  1. REQUIRE NOUN 20 (ICDU ANGLES)
R0099                  2. REQUIRE AVAILABILITY OF EXT VERB DISPLAY SYSTEM
R0100                  3. IF EITHER OF ABOVE CONDITIONS NOT PRESENT, TURN ON OPERATOR ERROR LIGHT AND GO TO PINBRNCH.
R0102                  4. SET EXT VERB DISPLAY ACTIVE FLAG.
R0103                  5. EXECUTE IMUZERO (ZERO IMU CDU ANGLES).
R0104                  6. EXECUTE IMUSTALL (ALLOW TIME FOR DATA TRANSFER).
R0105                  7. RELEASE EXT. VERB DISPLAY SYSTEM.

 0106   REF   1              43,2130  0 2142 1  VBZERO   TC      OP/INERT
 0107   REF   1              43,2131  0 2133 1           TC      IMUZEROK        RETURN HERE IF NOUN = ICDU(20)
 0108   REF   6  LAST  230   43,2132  0 2124 1           TC      ALM/END         RETURN HERE IF NOUN = OCDU(91)
A0109                                                                             (NOT IN USE YET)

 0110   REF   1              43,2133  0 2275 C  IMUZEROK TC      CKMODCAD        KEYBOARD REQUEST FOR ISS CDU ZERO
 0110A  REF   9  LAST  225   43,2134  0 4555 C           TC      BANKCALL
 0111   REF   1              43,2135    16516 1          CADR    IMUZERO

 0112   REF  10  LAST  232   43,2136  0 4555 C           TC      BANKCALL        STALL
 0113   REF   1              43,2137    17516 C          CADR    IMUSTALL
 0114                        43,2140  0 2141 1           TC      +1

 0115   REF   1              43,2141  0 2125 C           TC      GOPIN

 0116   REF   4  LAST  230   43,2142  4 4112 C  OP/INERT CS      OCT24
 0117   REF   2  LAST  187   43,2143  6 1002 1           AD      NOUNREG
 0118                        43,2144  0 0006 1           EXTEND
 0119   REF   1              43,2145  1 2474 C           BZF     XACTCQ          IF = 20.

 0120   REF  26  LAST  230   43,2146  24 002 C           INCR    Q
 0121   REF   1              43,2147  6 2153 1           AD      OPIMDIFF        -71
 0122                        43,2150  0 0006 1           EXTEND
 0123   REF   2  LAST  232   43,2151  1 2474 C           BZF     XACTCQ

 0124   REF   7  LAST  232   43,2152  0 2124 1           TC      ALM/END         ILLEGAL.

 0125                        43,2153   77670 C  OPIMDIFF DEC     -71
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R0126            VBCOARK     VERB 41            DESCRIPTION
R0127               COURSE ALIGN IMU OR OPTICS
R0128               1. REQUIRE NOUN 20 OR NOUN 91 OR TURN ON OPERATOR ERROR
R0129               2. REQUIRE EXT VERB DISPLAY SYS AVAILABLE OR TURN ON OPERATOR ERROR LIGHT AND GO TO PINBRNCH.
R0131               CASE 1     NOUN 20     (ICDU ANGLES)
R0132               3. SET EXT VERB DISPLAY ACTIVE FLAG.
R0133               4. DISPLAY FLASHING V25,N22 (LOAD NEW ICDU ANGLES).
R0134                  RESPONSES
R0135                    A. TERMINATE
R0136                       1. RELEASE EXT VERB DISPLAY SYSTEM
R0137                    B. PROCEED
R0138                       1. DISPLAY FLASHING V25,N23 (LOAD DELTA ICDU ANGLES).
R0140                             RESPONSES
R0141                               A. TERMINATE
R0142                                  1. RELEASE EXT VERB DISPLAY SYSTEM.
R0143                               B. PROCEED
R0144                                  1. EXECUTE ICORK2.
R0145                               C. ENTER
R0146                                  1. INCREMENT CDU ANGLES
R0147                                  2. EXECUTE ICORK2.
R0148                    C. ENTER
R0149                       1. EXECUTE ICORK2.
R0150               ICORK2
R0151                  1. RE-DISPLAY VERB 41.
R0152                  2. EXECUTE IMUCOARS (IMU COARSE ALIGN).
R0153                  3. EXECUTE IMUSTALL (ALLOW TIME FOR DATA TRANSFER).
R0154                  4. RELEASE EXT VERB DISPLAY SYSTEM.
R0155               CASE 2     NOUN 91     (OCDU ANGLES)
R0156               5. (REQUIRE OPTICS SWITCH TO BE AT COMPUTER OR TURN ON OPERATOR ERROR AND ALARM 115) AND (REQUIRE
R0158                  OPTICS AVAILABLE AND DISPLAY FLASHING V24,N92....LOAD NEW OPTICS ANGLES....OR TURN ON ALARM 117
R0160                  AND RELEASE EXT VERB DISPLAY SYSTEM).
R0161               6. RESPONSES TO V29,N92.
R0162                  A. TERMINATE
R0163                     RELEASE EXT VERB DISPLAY SYSTEM
R0164                  B. PROCEED OR ENTER
R0165                     RE-DISPLAY V41,    SET SWITCH TO INDICATE COURSE ALIGN OPTICS WORKING.
R0167                     RELEASE EXT VERB DISPLAY SYSTEM.

 0168   REF   2  LAST  232    43,2154  0 2142 1  VBCOARK  TC     OP/INERT
 0169   REF   1               43,2155  0 2157 0           TC     IMUCCARK       RETURN HERE IF NOUN = ICDU(20)
 0170   REF   1               43,2156  0 2201 0           TC     OPTCCARK       RETURN HERE IF NOUN = OCDU(91)
R0171            RETURN TO L+1 IF NOUN 20 - TO L+2 IF NOUN 91.
 0172   REF   2  LAST  232    43,2157  0 2275 0  IMUCOARK TC     CKMODCAD       COARSE ALIGN FROM KEYBOARD
 01721  REF   1               43,2160  0 2076 1           TC     TESTXACT
 0173   REF   1               43,2161  3 2177 1           CAF    VNLOCCDU       CALL FOR THETAD LOAD
 0174   REF  11  LAST  232    43,2162  0 4555 0           TC     BANKCALL
 0175   REF   1               43,2163    20465 1          CADR   GOXDSPF
 0176   REF   1               43,2164  0 5423 1           TC     TERMEXTV
 0177                         43,2165  1 2166 0           TCF    +1
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0178   REF   1                  43,2166   3 2200 1  ICORK2   CAF    IMUCCARV      RE-DISPLAY COARSE ALIGN VERB.
0179   REF  12  LAST  233       43,2167   0 4555 C             TC     BANKCALL
0180   REF   1                  43,2170    20746 C             CADR   EXDSPRET

0181   REF  13  LAST  234       43,2171   0 4555 C             TC     BANKCALL      CALL MODE SWITCHING PROG
0182   REF   1                  43,2172    16602 1             CADR   IMUCCARS

0183   REF  14  LAST  234       43,2173   0 4555 C             TC     BANKCALL      STALL
0184   REF   2  LAST  232       43,2174    17516 C             CADR   IMUSTALL
0185   REF   1                  43,2175   0 5423 1             TC     ENDEXTVB
0186   REF   2  LAST  234       43,2176   0 5423 1             TC     ENDEXTVB

0187                            43,2177    06226 1  VNLODCDU VN     2522
0188                            43,2200    12200 C  IMUCOARV VN     4100
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P0189 TEMPORARY ROUTINE TO RUN THE OPTICS CDUS FROM THE KEYBOARD

```
 0190   REF   2  LAST  187   43,2201  3 1323 1  OPTCDARK CA     OPTCADR
 019001 REF   3  LAST  233   43,2202  0 2276 0              TC     CKMODCAD +1
 019002 REF   2  LAST  233   43,2203  0 2076 1              TC     TESTXACT
 01901  REF   1              43,2204  3 4751 0              CAF    EBANK5
 01902  REF   7  LAST  197   43,2205  54 003 0              TS     EBANK

 0191   REF   7  LAST  161   43,2206  11'314 1              CCS    SWSAMPLE       SEE IF SWITCH AT COMPUTER
 0192                        43,2207  0 2214 1              TC     +5             SWITCH AT COMPUTER
 0193                        43,2210  0 2211 1              TC     +1             NOT ON COMPUTER
 0194   REF   4  LAST  231   43,2211  0 4400 1              TC     FALTON         TURN ON OPERATOR ERR
 0195   REF  18  LAST  228   43,2212  0 5537 0              TC     ALARM          AND ALARM
 0196                        43,2213   00115 1              OCT    00115

 0197   REF  18  LAST  217   43,2214  11'303 1              CCS    OPTIND         SEE IF OPTICS AVAILABLE
 0198   REF   1              43,2215  0 2223 0              TC     OPTC1          IN USE
 0199   REF   2  LAST  235   43,2216  0 2223 0              TC     OPTC1          IN USE
 0200   REF   3  LAST  235   43,2217  0 2223 0              TC     OPTC1          IN USE

 0201   REF  19  LAST  235   43,2220  0 5537 0              TC     ALARM          OPTICS RESERVED (OPTIND=-0)
 0202                        43,2221   00117 0              OCT    00117
 0203   REF   4  LAST  231   43,2222  0 5423 1              TC     ENDEXT

 0204   REF   1              43,2223  3 2243 0  OPTC1       CAF    VNLOOCDU       VERB-NOUN TO LOAD OPTICS CDUS
 0205   REF  15  LAST  234   43,2224  0 4555 0              TC     BANKCALL
 0206   REF   2  LAST  233   43,2225   20465 1              CADR   GOXDSPF
 0207   REF   2  LAST  233   43,2226  0 5423 1              TC     TERMEXTV
 0208                        43,2227  0 2230 1              TC     +1             PROCEED

 02082  REF   2  LAST   92   43,2230  3 1773 0              CA     SAC
 02084  REF   3  LAST  162   43,2231  55'161 1              TS     DESOPTS
 02086  REF   2  LAST   92   43,2232  3 1775 0              CA     PAC
 02088  REF   4  LAST  163   43,2233  55'160 0              TS     DESOPTT
 0209   REF   1              43,2234  3 2200 1              CAF    OPTCCARV       RE-DISPLAY OUR OWN VERB
 0210   REF  16  LAST  235   43,2235  0 4555 0              TC     BANKCALL
 0211   REF   2  LAST  234   43,2236   20746 0              CADR   EXDSPRET

 0212   REF  11  LAST  227   43,2237  3 4712 1              CAF    ONE
 0213   REF  19  LAST  235   43,2240  55'303 1              TS     OPTIND         SET COARS WORKING

 0214   REF   3  LAST  234   43,2241  0 5423 1              TC     ENDEXTVB
 0215   REF   4  LAST  235   43,2242  0 5423 1              TC     ENDEXTVB

 0216                        43,2243   06134 1  VNLOOCDU    VN     2492
 0217   REF   2  LAST  234   43,2200           OPTCOARV EQUALS IMUCCARV       DIFFERENT NOUNS.
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R0218              IMUFINEK     VERB 42              DESCRIPTION
R0219                 FINE ALIGN IMU
R0220                 1. REQUIRE EXT VERB DISPLAY AVAILABLE AND SET BUSY FLAG OR TURN ON OPER ERROR AND GO TO PINBRNCH.
R0222                 2. DISPLAY FLASHING V25,N93....LOAD DELTA GYRO ANGLES....
R0223                    RESPONSES
R0224                    A. TERMINATE
R0225                       1. RELEASE EXT VERB DISPLAY SYSTEM.
R0226                    B. PROCEED OR ENTER
R0227                       1. RE-DISPLAY VERB 42
R0228                       2. EXECUTE IMUFINE (IMU FINE ALIGN MODE SWITCHING).
R0229                       3. EXECUTE IMUSTALL (ALLOW FOR DATA TRANSFER)
R0230                          A. FAILED
R0231                             1. RELEASE EXT VERB DISPLAY SYSTEM.
R0232                          B. GOOD
R0233                             1. EXECUTE IMUPULSE (TORQUE IRIGS).
R0234                             2. EXECUTE IMUSTALL AND RELEASE EXT VERB DISPLAY SYSTEM.

 0236  REF   4  LAST  235   43,2244  0 2275 C  IMUFINEK TC      CKMODCAD        FINE ALIGN WITH GYRO TORQUING
 02361 REF   3  LAST  235   43,2245  0 2076 1            TC      TESTXACT
 0237  REF   1              43,2246  3 2273 C            CAF     VNLODGYR        CALL FOR LOAD OF GYRO COMMANDS
 0238  REF  17  LAST  235   43,2247  0 4555 C            TC      BANKCALL
 0239  REF   3  LAST  235   43,2250    20465 1            CADR    GOXDSPF
 0240  REF   3  LAST  235   43,2251  0 5423 1            TC      TERMEXTV
 0241                       43,2252  0 2253 1            TC      +1              PROCEED WITHOUT A LOAD

 0242  REF   1              43,2253  3 2274 1            CAF     IMUFINEV        RE-DISPLAY OUR OWN VERB
 0243  REF  18  LAST  236   43,2254  0 4555 C            TC      BANKCALL
 0244  REF   3  LAST  235   43,2255    20746 C            CADR    EXDSPRET

 0245  REF  19  LAST  236   43,2256  0 4555 C            TC      BANKCALL        CALL MODE SWITCH PROG
 0246  REF   1              43,2257    17012 1            CADR    IMUFINE

 0247  REF  20  LAST  236   43,2260  0 4555 C            TC      BANKCALL        HIBERNATION
 0248  REF   3  LAST  234   43,2261    17516 C            CADR    IMUSTALL
 0249  REF   5  LAST  235   43,2262  0 5423 1            TC      ENDEXTVB

 0250  REF   1              43,2263  3 2272 1  FINEK2    CAF     LGYROBIN        PINBALL LEFT COMMANDS IN OGC REGISTERS
 0251  REF  21  LAST  236   43,2264  0 4555 C            TC      BANKCALL
 0252  REF   1              43,2265    17125 1            CADR    IMUPULSE

 0253  REF  22  LAST  236   43,2266  0 4555 C            TC      BANKCALL        WAIT FOR PULSES TO GET OUT.
 0254  REF   4  LAST  236   43,2267    17516 C            CADR    IMUSTALL
 0255  REF   6  LAST  236   43,2270  0 5423 1            TC      ENDEXTVB
 0256  REF   7  LAST  236   43,2271  0 5423 1            TC      ENDEXTVB

 0257  REF   5  LAST  229   43,2272    02757 C  LGYROBIN ECADR   OGC
 0258                       43,2273    06335 1  VNLODGYR VN     2593
 0259                       43,2274    12400 C  IMUFINEV VN     4200            FINE ALIGN VERB

 02591 REF   4  LAST   78   43,2275  3 1322 C  CKMODCAD CA      MODECADR
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 02592                          43,2276  0 0006 1           EXTEND
 02593  REF   2  LAST  160      43,2277  1 6711 1           BZF     TCQ
 02594  REF   8  LAST  232      43,2300  0 2124 1           TC      ALM/END         SOMEBODY IS USING MODECADR SO EXIT
R0260           GOLOADLV   VERB 50              DESCRIPTION
R0261                      AND OTHER PLEASE
R0262                      DO SOMETHING VERBS
R0263                PLEASE PERFORM, MARK, CALIBRATE, ETC.
R0264                1. PRESSING ENTER ON DSKY INDICATES REQUESTED ACTION HAS BEEN  PERFORMED, AND THE PROGRAM DOES THE
R0266                   SAME RECALL AS A COMPLETED LOAD.
R0267                2. THE EXECUTION OF A VERB 33 (PROCEED WITHOUT DATA) INDICATES THE REQUESTED ACTION IS NOT DESIRED.

 0269   REF   1                 43,2301  0 4447 1  GOLOADLV TC      FLASHOFF
 0270   REF   1                 43,2302  3 4215 C           CAF     PINSLPBT
 0271                           43,2303  0 0006 1           EXTEND
 0272   REF   2  LAST  181      43,2304  01 007 1           WRITE   SUPERBNK        TURN ON FE7
 0273   REF   9  LAST  231      43,2305  0 4574 C           TC      POSTJUMP
 0274   REF   1                 40,2000                     SBANK=  PINSUPER
 0275   REF   1                 43,2306   62001 1          CADR    LOADLV1
R0276           V60     VERB 60

 0277                           43,2307  0 0006 1  V60      EXTEND                  SET ASTRONAUT TOTAL ATTITUDE (N17) EQUAL
 0278   REF   4  LAST  228      43,2310  3 0033 1           DCA     CDUX            TO PRESENT ATTITUDE
 0279   REF   1                 43,2311  53*334 C           DXCH    CPHIX
 0280   REF   4  LAST  218      43,2312  3 0034 C           CA      CDUZ
 0281   REF   2  LAST  237      43,2313  55*335 1           TS      CPHIX +2
 0282   REF   2  LAST  232      43,2314  0 2125 C           TC      GOPIN

R0283           V61     VERB 61

 0284   REF   5  LAST  196      43,2315  0 5447 C  V61      TC      DOWNFLAG        SET NEEDLFLG TO 0 (FLAGWRD0,BIT9), PHASE
 0285   REF   1                 43,2316   00006 1          ADRES   NEEDLFLG        PLANE A/P FOLLOWING ERROR DISPLAYED
 0286   REF   3  LAST  237      43,2317  0 2125 C           TC      GOPIN

R0287           V62     VERB 62

 0288   REF   3  LAST  225      43,2320  0 5435 C  V62      TC      UPFLAG          SET NEEDLFLG TO 1 (FLAGWRD0,BIT9),
 0289   REF   2  LAST  237      43,2321   00006 1          ADRES   NEEDLFLG        TOTAL ATTITUDE ERROR DISPLAYED

 0290   REF   4  LAST  237      43,2322  0 5435 C           TC      UPFLAG          SET N22ORN17 TO 1 (FLAGWRD9,BIT6),
 02902  REF   1                 43,2323   00220 1          ADRES   N22ORN17        COMPUTE TOTAL ATTITUDE ERROR WRT N22
 02904  REF   4  LAST  237      43,2324  0 2125 C           TC      GOPIN

R02905          V63     VERB 63

 02906  REF   5  LAST  237      43,2325  0 5435 C  V63      TC      UPFLAG          SET NEEDLFLG TO 1 (FLAGWRD0,BIT9),
 02907  REF   3  LAST  237      43,2326   00006 1          ADRES   NEEDLFLG        TOTAL ATTITUDE ERROR DISPLAYED

 02908  REF   6  LAST  237      43,2327  0 5447 C           TC      DOWNFLAG        SET N22ORN17 TO 0 (FLAGWRD9,BIT6,
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02909  REF   2  LAST  237   43,2330   00220 1        ADRES  N22ORN17      COMPUTE TOTAL ASTRONAUT ATTITUDE ERROR
029093 REF   5  LAST  237   43,2331   0 2125 0       TC     GOPIN
```

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P0291              ALINTIME     VERB 55              DESCRIPTION
R0292                   1. SET EXT VERB DISPLAY BUSY FLAG.
R0293                   2. DISPLAY FLASHING V25,N24 (LOAD DELTA TIME FOR AGC CLOCK.
R0294                   3. REQUIRE EXECUTION OF VERB 23.
R0295                   4. ADD DELTA TIME, RECEIVED FROM INPUT REGISTER, TO THE COMPUTER TIME.
R0297                   5. RELEASE EXT VERB DISPLAY SYSTEM

 0298   REF   1                                                  COUNT  04/R33

 0299   REF   4  LAST  236   43,2332  0 2076 1  ALINTIME TC     TESTXACT

 0300   REF   1               43,2333  3 2363 C           CAF    VNLODDT
 0301   REF  23  LAST  236    43,2334  0 4555 C           TC     BANKCALL
 0302   REF   1               43,2335   20465 1           CADR   GOMARKF
 0303   REF   5  LAST  239    43,2336  0 5423 1           TC     ENDEXT          TERMINATE
 0304   REF   6  LAST  239    43,2337  0 5423 1           TC     ENDEXT          PROCEED
 0305   REF   1               43,2340  4 2362 C           CS     DEC23           DATA IN OR RESEQUENCE(UNLIKELY)
 0306   REF  27  LAST  231    43,2341  6 0154 1           AD     MPAC            RECALL LEFT VERB IN MPAC
 0307                         43,2342  0 0006 1           EXTEND
 0308   REF   1               43,2343  1 2345 C           BZF    UPDATIME        GO AHEAD WITH UPDATE ONLY IF RECALL
 0309   REF   7  LAST  239    43,2344  0 5423 1           TC     ENDEXT            WITH V23 (DATA IN).
 0310                         43,2345  0 0004 C  UPDATIME INHINT                  DELTA TIME IS IN OSPTEM1, +1.
 0311   REF  22  LAST  231    43,2346  3 4714 1           CAF    ZERO
 0312   REF  28  LAST  239    43,2347  54 156 1           TS     MPAC     +2     NEEDED FOR TP AGREE
 0313   REF  19  LAST  216    43,2350  54 001 1           TS     L               ZERO T1 & 2 WHILE ALIGNING.
 0314   REF   7  LAST  218    43,2351  52 025 1           DXCH   TIME2
 0315   REF  29  LAST  239    43,2352  52 155 1           DXCH   MPAC
 0316   REF   2  LAST   73    43,2353  53*052 C           DXCH   OSPTEM2 +1       INCREMENT
 0317   REF  30  LAST  239    43,2354  20 155 1           DAS    MPAC

 0318   REF   1               43,2355  0 7226 C           TC     TPAGREE         FORCE SIGN AGREEMENT.
 0319   REF  31  LAST  239    43,2356  52 155 1           DXCH   MPAC            NEW CLOCK.
 0320   REF   8  LAST  239    43,2357  20 025 1           DAS    TIME2
 0321                         43,2360  0 0003 1           RELINT
 0322   REF   8  LAST  239    43,2361  0 5423 1  UPDTMEND TC     ENDEXT
 0323                         43,2362   00027 1  DEC23    DEC    23              V 23

 0324                         43,2363   06230 C  VNLODDT  VN     2524            V25N24 FOR LOAD DELTA TIME
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P0325              SYSTEST     VERB 92              DESCRIPTION
R0326                  OPERATE SELECTED SYSTEM TEST
R0327                  1. REQUIRE PCO OR PCC- OR TURN ON OPERATOR ERROR.
R0328                  2. TURN OFF DAP IF IT IS ON.
R0329                  3. DISPLAY FLASHING V21,N01 (LOAD TEST NUMBER 1 THRU 17).
R0330                  4. UPON ENTRY OF TEST NUMBER, SCHEDULE TSELECT WITH PRIORITY 20.
R0332                  TSELECT
R0333                     1. IF LOADED TEST NUMBER IS VALID, GO TO THAT TEST ROUTINE, OTHERWISE TURN ON OPERATOR ERROR AND
R0335                        REPEAT LOAD REQUEST DISPLAY. (NO. 3 ABOVE)

 0336   REF   2 LAST  201   E5,1425                          EBANK= QPLACE

 0337   REF   1                                             COUNT  04/EXTVB

 0338   REF   1             43,2364  0 2717 1  SYSTEST     TC     CHKPCOH
 0339   REF   1             43,2365  0 2723 C              TC     EXDAPOFF
 0340   REF   1             43,2366  3 4675 1              CAF    PRIO20
 0342   REF   2 LAST  178   43,2367  0 5042 1              TC     FINDVAC
 0343   REF   3 LAST  240   E5,1425                        EBANK= QPLACE
 0344   REF   1             30,2000                        SBANK= IMUSUPER
 0345   REF   1             43,2370   02002 1              2CADR  REDO
 0345   REF   1             43,2371   66065 1

 0346   REF   6 LAST  238   43,2372  0 2125 C              TC     GOPIN

R0347   REDO AND TSELECT ARE NOW IN SYSTEM TEST.

 0348   REF   2 LAST  229 TO  239:   218   218*           COUNT* $$/EXTVB
R0349              CKOPTVB     VERB 65              DESCRIPTION
R0350                  OPTICAL VERIFICATION FOR PRELAUNCH.
R0351                  1. SCHEDULE GCOMPVER, OPTICAL VERIFICATION SUBPROGRAM, WITH PRIORITY 17.

 0353   REF   4 LAST  225   43,2373  0 5253 C  CKOPTVB     TC     CHECKMM
 0354                       43,2374   00002 0              MM     02              I WONDER IF PRELAUNCH IS RUNNING
 0355   REF   9 LAST  237   43,2375  0 2124 1              TC     ALM/END         NOT RUNNING OPERATOR ERROR
 0356                       43,2376  0 0004 0              INHINT
 0357   REF   3 LAST  188   43,2377  3 4763 1              CAF    PRIO16           PRELAUNCH OPTICAL VERIFICATION
 0358   REF   3 LAST  240   43,2400  0 5042 1              TC     FINDVAC
 0359   REF   4 LAST  240   E5,1425                        EBANK= QPLACE
 0360   REF   2 LAST  208   43,2401   02000 0              2CADR  COMPVER         STANDARD LEADIN TO GCOMPVER.
 0360                       43,2402   66065 1
 0361   REF   7 LAST  240   43,2403  0 2125 C              TC     GOPIN

R0362   V 78....          TO CHANGE GYROCOMPASS AZIMUTH

 0363   REF   5 LAST  240   43,2404  0 5253 C  CHAZFCGC     TC     CHECKMM         IS IT PRELAUNCH
 03631                      43,2405   00002 0              MM     02
 03632  REF  10 LAST  240   43,2406  0 2124 1              TC     ALM/END         NO - OPERATOR ERROR
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0364   REF   4  LAST  24C   43,2407   3 4763 1        CAF     PRIO16          PRELAUNCH AZIMUTH CHANGE
0365   REF   4  LAST  24C   43,2410   0 5042 1        TC      FINDVAC
0366   REF  14  LAST  211   E5,1671                   EBANK=  XSM
0367   REF   2  LAST  20E   43,2411    03737 1        2CADR   AZMTHCG1
0367                        43,2412    66065 1
0368   REF   3  LAST  194   43,2413   0 5301 C        TC      PHASCHNG
0369                        43,2414    00174 C        OCT     00174
0370   REF   8  LAST  24C   43,2415   0 2125 C        TC      GOPIN
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```
P0371                IMUATTCK     VERB 43              DESCRIPTION
R0372                   LOAD IMU ATTITUDE ERROR METERS
R0373                   1. REQUIRE PROGRAM 00 ACTIVE, COARSE ALIGN ENABLE BIT OFF  AND ZERO ICDU BIT OFF.
R0375                   2. IF GUID REF RELEASE OR LIFTOFF HAS OCCURRED  REQUIRE EXT VERB DISPLAY AVAILABLE AND SET BUSY
R0377                      FLAG, OTHERWISE ALLOW CURRENT EXT VERB DISPLAY TO BE OVER-RIDDEN.
R0379                   3.  REMOVE COARSE ALIGN ENABLE AND IMU ERROR COUNTER ENABLE
R0380                   4. DISPLAY FLASHING V25,N22 (LOAD NEW ICDU ANGLES).
R0381                   5. UPON PROCEED OR ENTER RESPONSE, INITIALIZE CURRENT DAC AND COMMAND VALUES, ENABLE ERROR COUNTERS
R0383                      TRANSFER LOADED VALUES TO REGISTERS, AND SEND COMMANDS.
R0384                   6. IF BUSY FLAG SET, RESET IT TO RELEASE EXT VERB DISPLAY.

 0385   REF   2  LAST  240   43,2416  0 2717 1  IMUATTCK TC      CHKPOOH

 0386   REF   1             43,2417  3 2475 0           CA      OCTAL30        CHECK IF IMU ZERO AND IMU COARSE ARE ON
 0387                       43,2420  0 0006 1           EXTEND
 0388   REF  21  LAST  217  43,2421  02 012 0           RAND    CHAN12
 0389   REF  65  LAST  230  43,2422  10 000 0           CCS     A
 0390   REF  11  LAST  240  43,2423  1 2124 0           TCF     ALM/END        NOT ALLOWED IF IMU COARSE OR IMU ZERO ON

 0391   REF   1             43,2424  0 2463 1           TC      CKLFTBTS       IS IT BEFORE OR AFTER LIFTOFF
 0392   REF   5  LAST  239  43,2425  0 2076 1           TC      TESTXACT       AFTER
 0393   REF   1             43,2426  4 4726 1           CS      OCT50          REMOVE COARSE AND ECTR ENABLE.
 0394                       43,2427  0 0006 1           EXTEND
 0395   REF  22  LAST  242  43,2430  03 012 1           WAND    CHAN12

 0396   REF   2  LAST  233  43,2431  3 2177 1           CAF     VNLOCDU
 0397   REF  24  LAST  239  43,2432  0 4555 0           TC      BANKCALL
 0398   REF   4  LAST  236  43,2433   20465 1           CADR    GOXDSPF
 0399   REF   1             43,2434  1 2450 0           TCF     TRMATTCK
 0400                       43,2435  0 2436 1           TC      +1
 0401   REF   4  LAST  197  43,2436  3 4752 0           CAF     EBANK6
 0402   REF   8  LAST  235  43,2437  54 003 0           TS      EBANK          SET E6 FOR NEEDLES.

 0403   REF   5  LAST  211  E6,1476                     EBANK=  AK

 0404   REF  25  LAST  242  43,2440  0 4555 0           TC      BANKCALL       INITIALIZE CURRENT DAC AND
 0405   REF   1             43,2441   42427 0          CADR    NEEDLE11       COMMAND VALUES

 0406   REF  26  LAST  242  43,2442  0 4555 0           TC      BANKCALL       ENABLE ERROR COUNTERS.
 0407   REF   1             43,2443   42446 1          CADR    NEEDLER2

 0408   REF   4  LAST  230  43,2444  3 4711 1           CAF     TWO            4 MS MIN.
 0410   REF   9  LAST  227  43,2445  0 5140 1           TC      WAITLIST
 0411   REF   6  LAST  242  E6,1476                     EBANK=  AK
 0412   REF   1             43,2446   02453 1          2CADR   ATTCK1
 0412   REF   1             43,2447   66106 0
 0413   REF   2  LAST  242  43,2450  0 2463 1  TRMATTCK TC      CKLFTBTS       IS IT BEFORE OR AFRER LIFTOFF
 0414   REF   9  LAST  239  43,2451  1 5423 0           TCF     ENDEXT         AFTER
 0415   REF   9  LAST  241  43,2452  0 2125 0           TC      GOPIN
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0416                          43,2453  0 0006 1  ATTCK1   EXTEND                TRANSFER LOADED VALUES TO DESIRED REGS.
0417  REF   5 LAST   76       43,2454  3 1156 1            DCA     THETAD
0418  REF   7 LAST  242       43,2455  53'477 C            DXCH    AK
0419  REF   6 LAST  243       43,2456  31'157 C            CAE     THETAD +2
0420  REF   8 LAST  243       43,2457  55'500 1            TS      AK +2

0421  REF  18 LAST  227       43,2460  0 4633 C            TC      IBNKCALL      SENDS COMMANDS LIMITED TO +,- 384 PULSES
0422  REF   1                 43,2461   42462 1            CADR    NEEDLES       AND LEAVES ERROR COUNTERS ENABLED.

0423  REF  11 LAST  228       43,2462  0 5213 1            TC      TASKOVER

0424  REF  12 LAST  155       43,2463  3 4706 1  CKLFTBTS CAF     BIT5          HAS LIFTOFF OCCURRED
0425  REF   3 LAST  182       43,2464  7 0101 C            MASK    FLAGWRD5
0426  REF  66 LAST  242       43,2465  10 000 C            CCS     A
0427  REF  27 LAST  232       43,2466  0 0002 C            TC      Q             YES
0428  REF  13 LAST  243       43,2467  3 4706 1            CAF     BIT5
0429                          43,2470  0 0006 1            EXTEND
0430  REF   4 LAST  160       43,2471  02 030 C            RAND    CHAN30
0431  REF  67 LAST  243       43,2472  10 000 C            CCS     A
0432  REF   2 LAST  130       43,2473  1 6706 1            TCF     Q+1
0433  REF  28 LAST  243       43,2474  0 0002 C  XACTOQ    TC      Q             YES

0434                          43,2475   00030 1  OCTAL30   OCT     30
0435  REF   3 LAST  242       43,2476  0 2717 1  VB64      TC      CHKPOCH       DEMAND PROGRAM CO.
0436  REF   6 LAST  242       43,2477  0 2076 1            TC      TESTXACT      IF DISPLAY SYS. NOT BUSY,MAKE IT BUSY.
0437                          43,2500  0 0004 C            INHINT
0438  REF   1                 43,2501  3 4677 C            CAF     PRIO4
0439  REF   5 LAST  241       43,2502  0 5042 1            TC      FINDVAC
0440  REF   2 LAST   87       E4,1720                      EBANK=  RHOSB
0441  REF   1                 43,2503   03565 1            2CADR   SBANDANT      CALC.,DISPLAY S-BAND ANTENNA ANGLES.
0441  REF   1                 43,2504   64104 C
0442  REF   3 LAST  197       43,2505  0 5112 C            TC      ENDOFJOB

R0443           ENATMA    VERB 58              DESCRIPTION
R0444               ENABLE AUTOMATIC ATTITUDE MANEUVER

R0445       VERB58 RESETS STIKFLAG TO ENABLE R61 TO PERFORM AUTOMATIC TRACKING MANEUVERS, AFTER INTERUPTIONS BY RHC ACT-
R0447       IVITY.

0448  REF   7 LAST  237       43,2506  0 5447 C  ENATMA    TC      DOWNFLAG      RESET STIKFLAG.
0449  REF   2 LAST  194       43,2507   00020 C            ADRES   STIKFLAG      BIT 14  FLAG 1
0450  REF  10 LAST  242       43,2510  0 2125 C            TC      GOPIN

R0451           STRCKCN   VERB 68              DESCRIPTION
R0452               STROKE TEST SETUP/ENABLE
R0453               1. SET EXT VERB DISPLAY BUSY FLAG
R0454               2. SCHEDULE STRKTST1 WITH PRIORITY 30.
R0455               3. RELEASE EXT VERB DISPLAY.
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0456   REF   2  LAST  101   E6,1635                          EBANK= T5TVCDT
0457   REF   4  LAST  192   43,2511  4 0102 C  STROKON  CS     FLAGWRD6      V68    PERMITTED ONLY DURING TVC
0458   REF   3  LAST  192   43,2512  7 4105 C            MASK   OCT60000
0459                        43,2513  0 0006 1            EXTEND
0460   REF  12  LAST  242   43,2514  6 2124 1            BZMF   ALM/END      NOT TVC....FLASH OP ERROR LIGHT
0461   REF   5  LAST  230   43,2515  3 4371 C            CAF    PRIO30        JOB REQUEST, TO SET UP STROKE TEST,
0463   REF   6  LAST  224   43,2516  0 5027 1            TC     NOVAC              INCLUDING INITIALIZATIONS
0464   REF   2  LAST  101   E6,1614                        EBANK= STROKER
0465   REF   1               43,2517   03431 1           2CADR  STRKTSTI
0465   REF   1               43,2520   40106 1
0466   REF  11  LAST  243   43,2521  0 2125 C            TC     GOPIN

R0467              STABLISH     VERB 46              DESCRIPTION
R0468                   ESTABLISH G AND N CONTROL
R0469          1. IF TVC DAP IS ON, ALARM AND RETURN OTHERWISE REQUIRE EXT VERB DISPLAY SYSTEM
R0471                   AVAILABLE, SET BUSY FLAG AND GO TO DAPFIG TO DETERMINE VEHICLE CONFIGURATION.

0473   REF   5  LAST  244   43,2522  4 0102 C  STABLISH CS     FLAGWRD6      VB 46
0474   REF   4  LAST  244   43,2523  7 4105 C            MASK   OCT60000      NOT PERMITTED WHEN TVC DAP IS ON.
0475                        43,2524  0 0006 1            EXTEND
0476                        43,2525  6 2527 C            BZMF   +2
0477   REF  13  LAST  244   43,2526  0 2124 1            TC     ALM/END
0478   REF   5  LAST  242   43,2527  3 4752 C            CAF    EBANK6        SET EBANK TO E6
0479   REF   9  LAST  242   43,2530  54 0C3 C            TS     EBANK
0480   REF  10  LAST  237   43,2531  0 4574 C            TC     POSTJUMP
0481   REF   1               43,2532   65521 1           CADR   DAPFIG
```

```
P0482              CREWMANU     VERB 49              DESCRIPTION
R0483                  START AUTOMATIC ATTITUDE MANEUVER
R0484                  1. REQUIRE PROGRAM 00 ACTIVE.
R0485                  2. SET EXT VERB DISPLAY BUSY FLAG.
R0486                  3. SCHEDULE R62DISP WITH PRIORITY 10.
R0487                  4. RELEASE EXT VERB DISPLAY.

R0488                R62DISP
R0489                  1. DISPLAY FLASHING V06,N22 (DECIMAL DISPLAY NEW ICDU ANGLES). UPON IMMEDIATE RETURN, SET-UP GROUP
R0491                     4 FOR RESTART OF DISPLAY SEQUENCE.
R0492                     RESPONSES
R0493                     A. TERMINATE
R0494                        1. GO TO GOTOPOOH.
R0495                     B. PROCEED
R0496                        1. SET 3AXISFLG TO INDICATE MANEUVER IS SPECIFIED BY 3 AXIS.
R0498                        2. EXECUTE R60CSM (ATTITUDE MANEUVER).
R0499                        3. ZERO GROUP 4 (END R62).
R0500                     C. ENTER
R0501                        1. REPEAT FLASHING V06,N22.

 0502   REF   4  LAST  243    43,2533  0 2717 1  CREWMANU TC      CHKPOOH          DEMAND POO

 0503   REF   7  LAST  243    43,2534  0 2076 1           TC      TESTXACT

 05031  REF   1                43,2535  3 4676 1           CAF     PRIO10
 05032  REF   6  LAST  243    43,2536  0 5042 1           TC      FINDVAC
 0504   REF   1                  1155                     EBANK=  CPHI
 0505   REF   1                43,2537   02330 0         2CADR   R62DISP
 0505   REF   1                43,2540   56102 1
```

```
P0513                CAPDISP     VERB 48              DESCRIPTION
R0514                    LOAD AUTOPILOT DATA (ROUTINE R03)
R0515                    0. CHECKFAIL AND RETURN IF TVC.
R0516                    1. REQUIRE EXT VERB DISPLAY AVAILABLE AND SET BUSY FLAG.
R0517                    2. LOWER PRIORITY TO 10.
R0518                    3. DISPLAY FLASHING V04,N46 (DISPLAY AUTOPILOT CONFIGURATION)
R0520                    4. UPON PROCEED RESPONSE, EXECUTE S41.2.
R0521                    5. DISPLAY FLASHING V06,N47 (DISPLAY CSM WGT., LEM WGT.)
R0522                    6. UPON PROCEED RESPONSE EXECUTE S40.14.
R0523                    7. DISPLAY FLASHING V06,N48 (DISPLAY PITCH TRIM, YAW TRIM)
R0525                    8. UPON PROCEED RESPONSE, RELEASE EXTENDED VERB DESPLAY SYSTEM
 0527   REF   3 LAST  240 TO  246:    102   320*          COUNT*  $$/EXTVB
 0528   REF   6 LAST  244    43,2541  4 0102 0  CAPDISP  CS      FLAGWRD6
 0529   REF   5 LAST  244    43,2542  7 4105 0           MASK    OCT60000
 0530                        43,2543  0 0006 1           EXTEND
 0531                        43,2544  6 2546 1           BZMF    +2              TVC = 10, CS YIELDS 01, BZMF TO CONTINUE
 0532   REF  14 LAST  244    43,2545  0 2124 1           TC      ALM/END         RETURN IF TVC

 0533   REF   8 LAST  245    43,2546  0 2076 1           TC      TESTXACT
 05331  REF  27 LAST  242    43,2547  0 4555 0           TC      BANKCALL
 05332  REF   1              43,2550   64000 0           CADR    DAPDISP1
 0536                        42,2000                    BANK    42
 0537   REF   1              42,2000                    SETLOC  EXTVBS
 0538                        42,2000                    BANK
 0539   REF   1                                         COUNT   24/R03

 0540   REF   6 LAST  244    42,2000  3 4752 0  DAPDISP1 CAF     EBANK6
 0541   REF  10 LAST  244    42,2001  54 003 0           TS      EBANK

 05415  REF   2 LAST  245    42,2002  3 4676 1           CAF     PRIO10
 05416  REF   3 LAST  230    42,2003  0 5103 0           TC      PRIOCHNG

 0542   REF   1              42,2004  3 2061 1  DONCUN46 CAF     V04N46          R1          R2
 0543   REF  28 LAST  246    42,2005  0 4555 0           TC      BANKCALL        DAPDATR1    DAPDATR2
 0544   REF   5 LAST  242    42,2006   20465 1           CADR    GOXDSPF         GOXDSP ROUTINES USED FOR EXTENDED VERBS.

 0545   REF  10 LAST  242    42,2007  0 5423 1           TC      ENDEXT          EXT. VBS GO TO ENDEXT, NOT ENDOFJOB.
 0546                        42,2010  0 2012 0           TC      +2
 0547   REF   1              42,2011  0 2004 1           TC      DONCUN46

 05471  REF  11 LAST  209    42,2012  3 1466 1           CA      DAPDATR1
 05472  REF  17 LAST  197    42,2013  7 4707 1           MASK    BIT4
 05473  REF  68 LAST  243    42,2014  10 000 0           CCS     A
 05474  REF   1              42,2015  1 2054 0           TCF     MAXIN
 05475  REF   8 LAST  243    42,2016  0 5447 0           TC      DOWNFLAG
 05476  REF   1              42,2017   00212 0           ADRES   MAXDBFLG
 0548   REF  29 LAST  246    42,2020  0 4555 0  MAXOUT   TC      BANKCALL
 0549   REF   1              42,2021   40145 0           CADR    S41.2

 0550   REF   1              42,2022  3 2060 0  DONCUN47 CAF     V06N47          R1          R2          R3
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0551    REF  30  LAST  246   42,2023  0 4555 C          TC      BANKCALL        CSM WGT.   LEM WGT.    BLANK
0552    REF   6  LAST  246   42,2024    20465 1          CADR    GOXDSPF

0553    REF  11  LAST  246   42,2025  0 5423 1          TC      ENDEXT
0554                          42,2026  0 2030 C          TC      +2
0555    REF   1               42,2027  0 2022 C          TC      DONOUN47
055501  REF  12  LAST  246   42,2030  31'466 1          CAE     DAPDATR1        DC MASS PROPERTIES CALCULATION ONLY IF
055502  REF   6  LAST  244   42,2031  7 4371 1          MASK    PRIO30          CONFIG = 1(CSM), 2(CSM/LM), 6(CSM/LMA)
055503                        42,2032  0 0006 1          EXTEND
055504  REF   1               42,2033  1 2046 C          BZF     DONOUN48        SKIP IF 0, 4
055505                        42,2034  4 0000 0          COM
055506  REF   7  LAST  247   42,2035  7 4371 1          MASK    PRIO30
055507                        42,2036  0 0006 1          EXTEND
055508  REF   2  LAST  247   42,2037  1 2046 C          BZF     DONOUN48        SKIP IF 3, 7
055509                        42,2040  0 0004 0          INHINT
05551   REF  19  LAST  243   42,2041  0 4633 C          TC      IBNKCALL
05552   REF   2  LAST  193   42,2042    13176 C         CADR    MASSPROP        UPDATE IXX, IAVG, IAVG/TLX

055525                        42,2043  0 0003 1          RELINT
0556    REF  31  LAST  247   42,2044  0 4555 C          TC      BANKCALL
0557    REF   1               42,2045    40276 C         CADR    S40.14          COMPUTE RCS DAP STUFF

0558    REF   1               42,2046  3 2057 1  DONOUN48 CAF     V0648           R1         R2          R3
0559    REF  32  LAST  247   42,2047  0 4555 C          TC      BANKCALL        PTRIM      YTRIM       BLANK
0560    REF   7  LAST  247   42,2050    20465 1          CADR    GOXDSPF

0561    REF  12  LAST  247   42,2051  0 5423 1          TC      ENDEXT
0562    REF  13  LAST  247   42,2052  0 5423 1          TC      ENDEXT
0563    REF   3  LAST  247   42,2053  0 2046 1          TC      DONOUN48

0564    REF   6  LAST  237   42,2054  0 5435 C  MAXIN    TC      UPFLAG
0565    REF   2  LAST  246   42,2055    00212 C         ADRES   MAXDBFLG
0566    REF   1               42,2056  0 2020 1          TC      MAXOUT

05661                         42,2057    01460 1  V0648    VN      0648
056611                        42,2060    01457 C  V06N47   VN      0647
056612                        42,2061    01056 C  V04N46   VN      0446
05662                         43,2551                     BANK    43
05664   REF   2  LAST  229   43,2000                     SETLOC  EXTVERBS
05666                         43,2551                     BANK

0570    REF   4 LAST  246 TC  246:     8   328*          COUNT* $$/EXTVB
R0571             V82PERF     VERB 82                DESCRIPTION
R0572                  REQUEST ORBIT PARAMETERS DISPLAY (R30)
R0574   1. IF AVERAGE G IS OFF:
R0575             FLASH DISPLAY V04N06. R2 INDICATES WHICH SHIP'S STATE VECTOR IS
R0576              TO BE UPDATED. INITIAL CHOICE IS THIS SHIP (R2=1). ASTRONAUT
R0577              CAN CHANGE TO OTHER SHIP BY V22EXE, WHERE X NOT EQ 1.
R0578             SELECTED STATE VECTOR UPDATED BY THISPREC (OTHPREC).
R0579             CALLS SR30.1 (WHICH CALLS TFFCONMU + TFFRP/RA) TO CALCULATE
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R0580              RPER (PERIGEE RADIUS), RAPO (APOGEE RADIUS), HPER (PERIGEE
R0581              HEIGHT ABOVE LAUNCH PAD OR LUNAR LANDING SITE), HAPO (APOGEE
R0582              HEIGHT AS ABOVE), TPER (TIME TO PERIGEE), TFF (TIME TO
R0583              INTERSECT 300 KFT ABOVE PAD OR 35KFT ABOVE LANDING SITE).
R0584             FLASH MONITOR V16N44 (HAPO, HPER, TFF).TFF IS -59M59S IF IT WAS
R0585              NOT COMPUTABLE, OTHERWISE IT INCREMENTS ONCE PER SECOND.
R0586              ASTRONAUT HAS OPTION TO MONITOR TPER BY KEYING IN N 32 E.
R0587              DISPLAY IS IN HMS, IS NEGATIVE (AS WAS TFF), AND INCREMENTS
R0588              ONCE PER SECOND ONLY IF TFF DISPLAY WAS -59M59S.

R0589   2. IF AVERAGE G IS ON:
R0590             CALLS SR30.1 APPROX EVERY TWO SECS.  STATE VECTOR IS ALWAYS
R0591              FOR THIS VEHICLE. V82 DOES NOT DISTURB STATE VECTOR.  RESULTS
R0592              OF SR30.1 ARE RAPO, RPER, HAPO, HPER, TPER, TFF.
R0593             FLASH MONITOR V16N44 (HAPO, HPER, TFF).
R0594             IF MODE IS P11, THEN CALL DELRSPL SO ASTRONAUT CAN MONITOR
R0595              RESULTS BY N50E. SPLASH COMPUTATION DONE ONCE PER TWO SECS.


R0595.1 ADDENDUM: HAPO AND HPER SHOULD BE CHANGED TO READ HAPOX AND HPERX IN THE
R0596.2            ABOVE REMARKS.
 0596   REF    9  LAST  246    43,2551   0 2076 1  V82PERF  TC      TESTXACT
 0597   REF    1                43,2552   3 4756 1           CAF     PRIO7
 0598   REF    4  LAST  246    43,2553   0 5103 0           TC      PRIOCHNG
 0599   REF   11  LAST  244    43,2554   0 4574 0           TC      POSTJUMP
 0600   REF    1                43,2555    46332 1          CADR    V82CALL        ***** V82CALL MUST NOT BE A FINDVAC JOB.

R0601              V83PERF     VERB 83              DESCRIPTION
R0602                  REQUEST RENDEZVOUS PARAMETER DISPLAY (R31)
R0603                  1. SET EXT VERB DISPLAY BUSY FLAG.
R0604                  2. SCHEDULE V83CALL WITH PRIORITY 10.
R0605                     A. DISPLAY
R0606                           R1  RANGE
R0607                           R2  RANGE RATE
R0608                           R3  THETA

 0609   REF   10  LAST  248    43,2556   0 2076 1  V83PERF  TC      TESTXACT
 0610                          43,2557   0 0004 0           INHINT
 0611   REF    2  LAST  197    43,2560   4 0105 1           CS      FLAGWRD9       SET R31 FLAG-BIT 4 FLAGWRD9
 0612   REF   18  LAST  246    43,2561   7 4707 1           MASK    BIT4
 0613   REF    3  LAST  248    43,2562  26 105 1            ADS     FLAGWRD9
 0614   REF    4  LAST  230    43,2563   3 4754 0           CAF     PRIO5
 0615   REF    7  LAST  244    43,2564   0 5027 1           TC      NOVAC
 0616   REF    4  LAST  201    E4,1770                      EBANK=  SUBEXIT
 0617   REF    1                43,2565    03150 0          2CADR   R31CALL
 0617   REF    1                43,2566    72064 0
 0618   REF    4  LAST  243    43,2567   0 5112 0           TC      ENDOFJOB
```

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0619   REF  11  LAST  24E   43,2570  0 2076 1  V85PERF  TC      TESTXACT
0620                        43,2571  0 0004 0           INHINT
0621   REF  19  LAST  24E   43,2572  4 4707 1           CS      BIT4          RESET R31 FLAG TO INDICATE R34
0622   REF   4  LAST  24E   43,2573  7 0105 1           MASK    FLAGWRD9
0623   REF   5  LAST  249   43,2574  54 105 1           TS      FLAGWRD9
0624   REF   2  LAST  23C   43,2575  0 2563 0           TC      V83PERF +5
```

```
R0625            GOTOR21  VERB 57
R0626            GOTOR23- VERB 54  DESCRIPTION
R0627       SET LP MARKING FOR R22(REND TRACK DATA PROC)
R0628       1. SET EXT VERB DISPLAY BUSY FLAG
R0629       2. IF REND (P20 RUNNING) + TRACK (TRACKING ALLOWED) FLAGS ARE SET,
R0630          SCHEDULE R21 OR R23 WITH PRIORITY 16, OTHERWISE TURN ON ALARM 406
R0631       3. RELEASE EXT VERB DISPLAY SYSTEM
 0632  REF   9  LAST  246   43,2576  0 5447 C  GOTOR21  TC      DOWNFLAG        CLEAR R23FLG
 0633  REF   1             43,2577    00025 C            ADRES   R23FLG          BIT 9  FLAG 1
 0634                      43,2600  0 2603 C            TC      +3
 0635  REF   7  LAST  247   43,2601  0 5435 C  GOTOR23  TC      UPFLAG          SET R23FLG
 0636  REF   2  LAST  250   43,2602    00025 C            ADRES   R23FLG          BIT 9  FLAG 1
 0637  REF  12  LAST  249   43,2603  0 2076 1            TC      TESTXACT
 0638  REF   8  LAST  198   43,2604  3 0074 1            CA      FLAGWRD0        V8 57 UNNACCEPTABLE UNLESS BOTH
 0639  REF  24  LAST  219   43,2605  7 4704 1            MASK    BIT7                    RENDEZVOUS AND TRACK FLAGS ON
 0640                      43,2606  0 0006 1            EXTEND
 0641  REF   1             43,2607  1 2632 C            BZF     R22ALARM

 0642  REF   7  LAST  196   43,2610  3 0075 C            CA      FLAGWRD1
 0643  REF  14  LAST  243   43,2611  7 4706 C            MASK    BIT5
 0644                      43,2612  0 0006 1            EXTEND
 0645  REF   2  LAST  250   43,2613  1 2632 C            BZF     R22ALARM

 0646  REF   8  LAST  250   43,2614  3 0075 C            CA      FLAGWRD1        TEST R23FLG
 0647  REF  17  LAST  217   43,2615  7 4702 1            MASK    BIT9
 0648                      43,2616  0 0006 1            EXTEND
 0649  REF   1             43,2617  1 2625 C            BZF     REGR21          R21
 0650  REF   5  LAST  241   43,2620  3 4763 1            CAF     PRIO16
 0652  REF   8  LAST  248   43,2621  0 5027 1            TC      NOVAC
 0653  REF  12  LAST  227   E7,1725                      EBANK=  MRKBUF1
 0654  REF   1             43,2622    02447 1            2CADR   R23CSM
 0654  REF   1             43,2623    76067 1
 0655  REF   5  LAST  248   43,2624  0 5112 C            TC      ENDOFJOB
 0656  REF   6  LAST  250   43,2625  3 4763 1  REGR21    CAF     PRIO16
 0658  REF   9  LAST  250   43,2626  0 5027 1            TC      NOVAC
 0659  REF  13  LAST  250   E7,1725                      EBANK=  MRKBUF1
 0660  REF   1             43,2627    02445 C            2CADR   R21CSM
 0660  REF   1             43,2630    76067 1
 0661  REF   6  LAST  250   43,2631  0 5112 C            TC      ENDOFJOB
 0662  REF  20  LAST  235   43,2632  0 5537 C  R22ALARM  TC      ALARM           VERB 57 WAS SELECTED AND NEITHER REND
 0663                      43,2633    00406 C            OCT     00406             NOR TRACK FLAG WERE ON.
 0664  REF  14  LAST  247   43,2634  0 5423 1            TC      ENDEXT
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P0665              VERB 86    DESCRIPTION
R0666                V86 IS TC R23 AS MARK REJECT IS TO R21
R0667                V86 IS THE MARK REJECT FOR R23(THE BACKUP MARKING ROUTINE)
 0668   REF  14  LAST  250   E7,1725                          EBANK= MRKBUF1
 0669   REF   1              43,2635   3 4753 1  V86PERF    CAF    EBANK7        BACKUP MARK REJECT (R23)
 0670   REF  11  LAST  246   43,2636   56 003 1              XCH    EBANK
 0671   REF   8  LAST  223   43,2637   3 7716 0              CA     NEGONE
 0672   REF  15  LAST  251   43,2640   55*725 1              TS     MRKBUF1
 0673   REF  12  LAST  244   43,2641   0 2125 0              TC     GOPIN
```

```
P0689              TRACKTRM     VERB 56              DESCRIPTION
R0690                  TERMINATE TRACKING (P20)
R0691                  1. KNOCK DOWN RENDEZVOUS, TRACK, AND UPDATE FLAGS.
R0692                  2. REQUIRE P20 NOT RUNNING ALONE OR GO TO GOTOPOOH (REQUEST PROGRAM 00).
R0694                  3. REQUIRE R22 RUNNING OR GO TO PINBRNCH.
R0695                  4. IF INTEGRATION RUNNING, STALL UNTIL IT IS COMPLETED, THEN ZERO GROUPS 2 AND 3 TO KILL R21 + R22.
R0697                  3. KNOCK DOWN RENDEZVOUS, R22, R21, TRACK, UPDATE, AND TARGI FLAGS.
R0699                  4. GO TO ENEMA (SOFTWARE RESTART).
R0700                  REFERENCE
R0701                     P20 RENDEZVOUS  NAVIGATION.
R0702                     R21 RENDEZVOUS  TRACKING SIGHTING MARK.
R0703                     R22 RENDEZVOUS  TRACKING DATA PROCESSING.

 0704   REF  25  LAST  250   43,2642  3 4704 C  TRACKTRM CA     BIT7          IS REND FLAG ON
 0705   REF   9  LAST  250   43,2643  7 0074 C           MASK   FLAGWRD0
 0706                        43,2644  0 0006 1           EXTEND
 0707   REF  13  LAST  251   43,2645  1 2125 1           BZF    GOPIN         NO

 0708   REF  10  LAST  250   43,2646  0 5447 C           TC     DOWNFLAG
 0709   REF   1              43,2647   00010 C           ADRES  RNDVZFLG

 0710   REF  15  LAST  250   43,2650  3 4706 1           CA     BIT5          IS TRACK FLAG ON
 0711   REF   9  LAST  250   43,2651  7 0075 1           MASK   FLAGWRD1
 0712                        43,2652  0 0006 1           EXTEND
 0713   REF  14  LAST  252   43,2653  1 2125 1           BZF    GOPIN         NO

 0714   REF  11  LAST  252   43,2654  0 5447 C           TC     DOWNFLAG
 0715   REF   1              43,2655   00031 C           ADRES  TRACKFLG

07151   REF  12  LAST  252   43,2656  0 5447 C           TC     DOWNFLAG
07152   REF   1              43,2657   00027 1           ADRES  UPDATFLG

 0716   REF  13  LAST  252   43,2660  0 5447 C           TC     DOWNFLAG
 0717   REF   2  LAST  196   43,2661   00007 C           ADRES  IMUSE

07173   REF   7  LAST  246   43,2662  3 4752 C           CAF    EBANK6
07174   REF  12  LAST  251   43,2663  54 003 C           TS     EBANK

07175   REF  33  LAST  247   43,2664  0 4555 C           TC     BANKCALL
07176   REF   3  LAST  198   43,2665   45245 C           CADR   STOPRATE

07177   REF   9  LAST  251   43,2666  3 7716 C           CAF    NEGONE
07178   REF  20  LAST  235   43,2667  55'303 1           TS     OPTIND

 0718   REF   2  LAST  194   43,2670  0 6006 1           TC     INTPRET
 0719                        43,2671   77624 1           CALL
 0720   REF   3  LAST  203   43,2672   27371 1                  INTSTALL      DONT INTERRUPT INTEGRATION
 0721                        43,2673   77776 1           EXIT

 0722   REF   1              43,2674  0 5261 1           TC     2PHSCHNG
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 0723                          43,2675   00002 0          OCT    2          KILL GROUP 2 TO HALT P20 ACTIVITY
 0724                          43,2676   00001 0          OCT    1          ALSO KILL GROUP 1

 0725                          43,2677   0 0004 0  CLEANOUT INHINT
 0726  REF  12  LAST  248     43,2700   0 4574 0          TC     POSTJUMP
 0727  REF   2  LAST  184     43,2701    12632 0          CADR   ENEMA       CAUSE RESTART


R0728          LEMVEC    VERB 60              DESCRIPTION
R0729              UPDATE LEM STATE VECTOR
R0730                RESET VEHUPFLG TO 0

 0731  REF  14  LAST  252     43,2702   0 5447 0  LEMVEC  TC     DOWNFLAG
 0732  REF   1               43,2703    00026 0          ADRES  VEHUPFLG    VEHUPFLG DOWN INDICATES LEM

 0733  REF  15  LAST  252     43,2704   1 2125 1          TCF    GOPIN


R0734          CSMVEC    VERB 61              DESCRIPTION
R0735              UPDATE CSM STATE VECTOR
R0736                SET   VEHUPFLG TO 1

 0737  REF   8  LAST  250     43,2705   0 5435 0  CSMVEC  TC     UPFLAG
 0738  REF   2  LAST  253     43,2706    00026 0          ADRES  VEHUPFLG    VEHUPFLG UP INDICATES CM.

 07383 REF  16  LAST  253     43,2707   1 2125 1          TCF    GOPIN

R0749          DNEDUMP   VERB 74              DESCRIPTION
R0750              INITIALIZE DOWN-TELEMETRY PROGRAM FOR ERASABLE MEMORY DUMP.
R0751              1. SET EXT VERB DISPLAY BUSY FLAG.
R0752              2. REPLACE CURRENT DOWNLIST WITH ERASABLE MEMORY.
R0753              3. RELEASE EXT VERB DISPLAY.

 0754                           0010                    EBANK= 10
 0756  REF   1               43,2710   3 2713 0  DNEDUMP  CAF    LDNDUMPI
 0757  REF   2  LAST  184     43,2711   54 335 0          TS     DNTMGOTO
 0758  REF  17  LAST  253     43,2712   0 2125 0          TC     GOPIN

 0759  REF   2  LAST  229     43,2710            V74     EQUALS DNEDUMP
 0760  REF   1               43,2713    03532 0  LDNDUMPI REMADR DNDUMPI


R0761          LFTFLGON  VERB 75              DESCRIPTION
R0762              SET LIFT-OFF FLAG
R0763              1. SETUP GGRBKFLG, GUIDANCE REFERENCE RELEASE BACK-UP FLAG.
R0764              2. RETURN VIA PINBRNCH

 0765  REF   9  LAST  253     43,2714   0 5435 0  LFTFLGON TC    UPFLAG     V8 75 - SET LIFTOFF FLAG BIT
 0766  REF   1               43,2715    00125 1          ADRES  GRRBKFLG    BIT 5  FLAG 5
 0767  REF  18  LAST  253     43,2716   0 2125 0          TC     GOPIN
```

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0768   REF   5  LAST  196   43,2717  3 1011 C  CHKPCCH  CA      MODREG
0769                       43,2720  0 0006 1           EXTEND
0770   REF   3  LAST  237   43,2721  1 6711 1           BZF     TCQ
0771   REF  15  LAST  246   43,2722  1 2124 C           TCF     ALM/END

0772                       43,2723  0 0006 1  EXDAPOFF EXTEND
0773   REF   1              43,2724  3 2733 1           DCA     IDLECADR        SET T5 TO IDLE.
0774   REF   4  LAST  182   43,2725  53'313 C           DXCH    T5LOC
0775   REF   6  LAST  246   43,2726  4 4105 C           CS      OCT60000
0776   REF   7  LAST  246   43,2727  7 0102 C           MASK    FLAGWRD6        RESET CAPBITS 1 AND 2.
0777   REF   8  LAST  254   43,2730  54 102 C           TS      FLAGWRD6
0778   REF  29  LAST  243   43,2731  0 0002 C           TC      Q

0779   REF  10  LAST  210   E6,1425                     EBANK=  PACTOFF
0780   REF   3  LAST  198   43,2732   03132 1  IDLECADR 2CADR   T5IDLOC
0780                       43,2733   12106 C
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R0781   VERB 89 DESCRIPTION     RENDEZVOUS FINAL ATTITUDE ROUTINE (R63)

R0782   CALLED BY VERB 89 ENTER DURING P00. PRIO 10 USED. CALCULATES AND
R0783   DISPLAYS FINAL GIMBAL ANGLES TO POINT CSM +X AXIS OR PREFERRED AXIS
R0784   (UNIT(Z)COS55 DEG + UNIT(X)SIN55 DEG) AT LM.

R0785   1. KEY IN V 89 E ONLY IF IN PROG 00. IF NOT IN P00, OPERATOR ERROR AND
R0786   EXIT R63, OTHERWISE CONTINUE.

R0787   2. IF IN P00, DO IMU STATUS CHECK (R02BCTH). IF IMU ON AND ITS
R0788   ORIENTATION KNOWN TO CGC, CONTINUE.

R0789   3. FLASH DISPLAY V 04 N 06. R2 INDICATES WHICH SPACECRAFT AXIS IS TO
R0790   BE POINTED AT LM.  INITIAL CHOICE IS PREFERRED AXIS. (R2=1).
R0791   ASTRONAUT CAN CHANGE TO (+X) AXIS (R2 NOT= 1) BY V 22 E 2 E. CONTINUE
R0792   AFTER KEYING IN PROCEED.

R0793   4. SET PREFERRED ATTITUDE FLAG ACCORDING TO OPTION DESIRED. SET FLAG
R0794   FOR PREFERRED AXIS. RESET FLAG FOR X AXIS.

R0795   5. CURRENT TIME IS STORED AND R63COMP IS CALLED

R0796        R63COMP JOB:
R0797        UPDATES CSM AND LM STATE VECTORS USING CONIC EQUATIONS

R0798        CALCULATES BOTH PREFERRED AND X AXIS TRACKING ATT FROM CSM TO LM.

R0799        DESIRED GIMBAL ANGLES AS INDICATED BY PREFERRED ATTITUDE FLAG
R0800        ARE STORED FOR LATER R60CSM CALL.

R0801   6. FLASH DISPLAY V 06 N18 AND AWAIT RESPONSE.

R0802   7. RECYCLE- RETURN TO STEP 5.
R0803      TERMINATE- EXIT R63 ROUTINE
R0804      PROCEED- RESET 3AXISFLG AND CALL R60CSM FOR ATTITUDE MANEUVER.


0805  REF   5  LAST  245   43,2734  0 2717 1  V89PERF  TC      CHKPOOH          DEMAND P00
0806  REF  13  LAST  250   43,2735  0 2076 1           TC      TESTXACT
0807                       43,2736  0 0004 0           INHINT
0808  REF   3  LAST  246   43,2737  3 4676 1           CAF     PRIO10
0809  REF   7  LAST  245   43,2740  0 5042 1           TC      FINDVAC
0810  REF   2  LAST   87   E4,1715                     EBANK=  P21TIME
0811  REF   1              43,2741   03603 1           2CADR   V89CALL
0811  REF   1              43,2742   70064 1
0812  REF   7  LAST  250   43,2743  1 5112 1           TCF     ENDOFJOB

0813                       43,2744  0 0004 0  WMATRXNG INHINT                   V8 86 - CLEAR RENDWFLG TO REINITIALIZE
0814  REF  27  LAST  227   43,2745  4 4712 0           CS      BIT1                     W-MATRIX
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0815   REF   4  LAST  243   43,2746   7 0101 C            MASK    FLAGWRD5
0816   REF   5  LAST  256   43,2747   54 101 C            TS      FLAGWRD5

0817   REF  19  LAST  253   43,2750   0 2125 C            TC      GOPIN

0818   REF   1              43,2751                GOSHOSUM EQUALS SHOWSUM

0819   REF   6  LAST  255   43,2751   0 2717 1  SHOWSUM   TC      CHKPCCH
0820   REF  14  LAST  255   43,2752   0 2076 1            TC      TESTXACT    *
0821   REF   1              43,2753   3 4712 1            CAF     S+1         *
0822   REF   2  LAST   79   43,2754   55'376 C            TS      SKEEP6      * SHOWSUM OPTION
0823   REF   1              43,2755   3 4714 1            CAF     S+ZERO      *
0824   REF   3  LAST  178   43,2756   55'362 C            TS      SMODE       * TURN OFF SELF-CHECK
0825   REF   1              43,2757   3 3242 C            CA      SELFADRS    *
0826   REF   3  LAST  187   43,2760   55'361 C            TS      SELFRET     *
0827   REF   1              43,2761   0 3517 1            TC      STSHCSUM    * ENTER ROPECHK

0828   REF   2  LAST   79   43,2762   23'372 C  SDISPLAY  LXCH    SKEEP2      * BNK NO FOR DSP
0829   REF   2  LAST   79   43,2763   23'373 1            LXCH    SKEEP3      * BUGGER WORD FOR DSP
0830   REF   1              43,2764   3 3241 C  NOKILL    CA      ADRS1       *
0831   REF  32  LAST  239   43,2765   54 156 1            TS      MPAC +2     *
0832   REF   1              43,2766   3 2777 1            CA      VNCON       * 0501
0833   REF  34  LAST  252   43,2767   0 4555 C            TC      BANKCALL    *
0834   REF   8  LAST  247   43,2770    20465 1            CADR    GOXDSPF     *
0835                        43,2771   0 2774 1            TC      +3          *
0836   REF   1              43,2772   0 3630 1            TC      NXTBNK      *
0837   REF   1              43,2773   0 2764 C            TC      NOKILL      *
08375  REF   2  LAST  256   43,2774   3 3242 C            CA      SELFADRS
08376  REF   2  LAST   79   43,2775   55'371 1            TS      SKEEP1

0838   REF  15  LAST  250   43,2776   0 5423 1            TC      ENDEXT      *

0839                        43,2777    01201 C  VNCON     VN      501         *

0840   REF   3  LAST  256   43,3000   3 1376 1  ENDSUMS   CA      SKEEP6      *
0841                        43,3001   0 0006 1            EXTEND              *
0842   REF   2  LAST  187   43,3002   1 3333 C            BZF     SELFCHK     * ROPECHK, START SELFCHK AGAIN.
0843   REF   2  LAST  256   43,3003   0 3517 1            TC      STSHCSUM    * START SHOWSUM AGAIN.

R0844  VERB 79 REQUEST LUNAR LANDMARK SELECTION.  RESTRICTED TO POO.

0845   REF   7  LAST  256   43,3004   0 2717 1  CALLR35   TC      CHKPCCH
0846   REF  15  LAST  256   43,3005   0 2076 1            TC      TESTXACT

0847   REF   5  LAST  248   43,3006   3 4754 C            CAF     PRIO5
0849   REF   8  LAST  255   43,3007   0 5042 1            TC      FINDVAC
0850   REF   2  LAST   87   E4,1725                       EBANK=  KLOCPCNT
0851   REF   1              43,3010    03215 1            2CADR   LNDMKSEL
0851   REF   1              43,3011    62064 1
0852   REF   8  LAST  255   43,3012   0 5112 C            TC      ENDOFJOB    R35 WILL DO ENDEXT
```

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R0853                VB 76  SET PREFERRED ATTITUDE FLAG - DRIVE TO PREFERRED.

 0854   REF  10  LAST  253   43,3013  0 5435 C  SETPRFLG TC      UPFLAG
 0855   REF   1              43,3014   00120 1            ADRES   PRFTRKAT       BIT 10  FLAG 5
 0856   REF  20  LAST  256   43,3015  0 2125 C            TC      GOPIN

R0857                VB 77  RESET PREFERRED ATTITUDE FLAG - DRIVE TO +X-AXIS ATT.

 0858   REF  15  LAST  253   43,3016  0 5447 C  RESETPRF TC      DOWNFLAG
 0859   REF   2  LAST  257   43,3017   00120 1            ADRES   PRFTRKAT       BIT 10  FLAG 5
 0860   REF  21  LAST  257   43,3020  0 2125 C            TC      GOPIN

R0861                VB 87  SET VHF RANGE FLAG - ALLOWS R22 TO ACCEPT RANGE DATA.

 0862   REF   3  LAST  252   43,3021  0 6006 1  SETVHFLG TC      INTPRET
 0863                        43,3022   77414 C            SET     EXIT
 0864   REF   2  LAST  194   43,3023   04466 1                    VHFRFLAG
 0865   REF  22  LAST  257   43,3024  0 2125 C            TC      GOPIN

R0866                VB 88  RESET VHF RANGE FLAG - STOPS ACCEPTANCE OF RANGE DATA.

 0867   REF   4  LAST  257   43,3025  0 6006 1  RESETVHF TC      INTPRET
 0868                        43,3026   77414 C            CLEAR   EXIT
 0869   REF   3  LAST  257   43,3027   04666 C                    VHFRFLAG
 08695  REF   1              43,3030  0 5520 C            TC      TRFAILOF        TRACKER FAIL LIGHT

 0870   REF  23  LAST  257   43,3031  0 2125 C            TC      GOPIN

R0871   VERB 66.  VEHICLES ARE ATTACHED.- MOVE THIS VEHICLE STATE VECTOR TO
R0872                THER VEHICLE STATE VECTOR.

R0873        USE SUBROUTINE GENTRAN.

 0874   REF   1              E3,1554                    EBANK=  RRECTHIS
 0875   REF   4  LAST  255   43,3032  3 4676 1  ATTACHED CAF     PRIO10
 0876   REF   9  LAST  256   43,3033  0 5042 1            TC      FINDVAC
 08761  REF   2  LAST  257   E3,1554                    EBANK=  RRECTHIS
 08762  REF   1              43,3034   03037 C            2CADR   ATTACHIT
 08762  REF   1              43,3035   66103 C
 08763  REF   9  LAST  256   43,3036  0 5112 C            TC      ENDOFJOB

 0877   REF   5  LAST  257   43,3037  0 6006 1  ATTACHIT TC      INTPRET
 0878                        43,3040   77624 1            CALL
 0879   REF   4  LAST  252   43,3041   27371 1                    INTSTALL
 08791                       43,3042   43014 C            SET     BON
 08792  REF   1              43,3043   04064 1                    MOONCTH
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08793  REF   1                 43,3044   04303 C                 MOONTHIS
08794                          43,3045   67050 0                 +3
08795                          43,3046   77614 1          CLEAR
08796  REF   2  LAST  257      43,3047   04264 C                 MOONCTH
0880                           43,3050   77776 1          EXIT
0881   REF   1                 43,3051  3 3076 C          CAF    OCT51
0882   REF   5  LAST  221      43,3052   0 5475 1          TC     GENTRAN
0883   REF   3  LAST  257      43,3053    01554 1          ADRES  RRECTHIS      OUR STATE VECTOR INTO OTHER VIA GENTRAN
0884   REF   1                 43,3054    01626 1          ADRES  RRECTOTH

08845                          43,3055   0 0003 1  TACHEXIT RELINT
08845  REF   6  LAST  257      43,3056   0 6006 1          TC     INTPRET
08847                          43,3057    77624 1          CALL                UPDATE RN, VN, R-OTHER, V-OTHER
08849  REF   1                 43,3060    26662 1                 PTOACSM
08861                          43,3061    45154 C          LXA,2  CALL
08863  REF   2  LAST   86      43,3062    02150 1                 PBODY
08865  REF   1                 43,3063    20237 C                 SVDWN1
08867                          43,3064    77624 1          CALL
08869  REF   1                 43,3065    20263 1                 SVDWN2
08871                          43,3066    77776 1          EXIT

0885   REF   1                 43,3067  3 3077 1          CAF    TCPINAD
0886   REF   1                 43,3070   5C 120 1          INDEX  FIXLOC
0887   REF   7  LAST  226      43,3071   54 052 1          TS     QPRET
0888   REF   13 LAST  253      43,3072   0 4574 C          TC     POSTJUMP
0889   REF   1                 43,3073    27406 C          CADR   INTWAKE

0890                           43,3074    77634 C  TCPIN    RTB
0891   REF   3  LAST  231      43,3075    21176 1                 PINBRNCH

0892                           43,3076    00051 C  OCT51    OCT    51
0893   REF   1                 43,3077    67074 C  TCPINAD  CADR   TCPIN

RC89302 VERB 47  MOVE LM STATE VECTOR INTO CM STATE VECTOR.

089304 REF   5  LAST  257      43,3100  3 4676 1  LMTOCMSV CAF    PRIO10
089305 REF   10 LAST  257      43,3101  0 5042 1           TC     FINDVAC
089306 REF   4  LAST  258      E3,1554                    EBANK= RRECTHIS
089307 REF   1                 43,3102    03105 C          2CADR  LMTOCM
089307 REF   1                 43,3103    66103 C
089308 REF   10 LAST  257      43,3104   0 5112 C          TC     ENDOFJOB

089309 REF   7  LAST  258      43,3105   0 6006 1  LMTOCM   TC     INTPRET
08931                          43,3106    77624 1          CALL
089312 REF   5  LAST  257      43,3107    27371 1                 INTSTALL
089314                         43,3110    43014 C          SET    BON
089316 REF   2  LAST  258      43,3111    04063 C                 MOONTHIS
089318 REF   3  LAST  258      43,3112    04304 1                 MOONCTH
08932                          43,3113    67116 C                 +3
089322                         43,3114    77614 1          CLEAR
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089324 REF   3 LAST  258   43,3115   04263 1                  MOONTHIS
089328                     43,3116   77776 1          EXIT

08933  REF   2 LAST  258   43,3117   3 3076 0         CAF      OCT51
089332 REF   6 LAST  258   43,3120   0 5475 1         TC       GENTRAN
089334 REF   2 LAST  258   43,3121    01626 1         ADRES    RRECTOTH      LM STATE VECTOR INTO CM VIA GENTRAN
089336 REF   5 LAST  258   43,3122    01554 1         ADRES    RRECTHIS

089338 REF   1             43,3123   1 3055 0         TCF      TACHEXIT

R0894  VERB 94  DO R64 VIA ENEMA TO PICK UP IN P23.

 0895  REF  13 LAST  197   43,3124   3 4700 1 VER894  CAF      BIT11
 0896  REF   6 LAST  249   43,3125   7 0105 1         MASK     FLAGWRD9      IS V94FLAG SET
 0897                      43,3126   0 0006 1         EXTEND
 0898  REF  16 LAST  254   43,3127   1 2124 0         BZF      ALM/END       NO - OPERATOR ERROR

 0899  REF  16 LAST  257   43,3130   0 5447 0         TC       DOWNFLAG
 0900  REF   1             43,3131    00213 1         ADRES    V94FLAG

 0901  REF   6 LAST  240   43,3132   0 5253 0         TC       CHECKMM       IS IT P23
 0902                      43,3133    00027 1         MM       23
 0903  REF  17 LAST  259   43,3134   0 2124 1         TC       ALM/END       NO - OPERATOR ERROR
 0904  REF   4 LAST  241   43,3135   0 5301 0         TC       PHASCHNG
 0905                      43,3136    00112 0         OCT      112           SET GROUP 2 TO DO R64

 0906  REF   1             43,3137   0 2677 0         TC       CLEANOUT      CAUSE RESTART

R0907          V90PERF     VERB 90              DESCRIPTION
R0908              REQUEST RENDEZVOUS OUT-OF-PLANE DISPLAY (R36)
R0909              1. SET EXT VERB DISPLAY BUSY FLAG.
R0910              2. SCHEDULE R36 CALL WITH PRIORITY 10
R0911                 A. DISPLAY
R0912                      TIME OF EVENT - HOURS , MINUTES , SECONDS
R0913                      Y  OUT-OF-PLANE POSITION - NAUTICAL MILES
R0914                      YDOT  OUT-OF-PLANE VELOCITY - FEET/SECOND
R0915                      PSI  ANGLE BTW LINE OF SIGHT AND FORWARD
R0916                           DIRECTION VECTOR IN HORIZONTAL PLANE - DEGREES
 0917  REF  16 LAST  256   43,3140   0 2076 1 V90PERF  TC       TESTXACT
 0918  REF   2 LAST  248   43,3141   3 4756 1         CAF      PRIO7         R36.V90
 0920  REF  11 LAST  258   43,3142   0 5042 1         TC       FINDVAC
 0921  REF   2 LAST   88   E4,1726                     EBANK=   RPASS36
 0922  REF   1             43,3143    02746 0         2CADR    R36
 0922  REF   1             43,3144    10104 0
 0923  REF  11 LAST  258   43,3145   1 5112 1         TCF      ENDOFJOB
R0924  VERB 96  SET QUITFLAG TO STOP INTEGRATION.

 0930  REF  11 LAST  257   43,3146   0 5435 0 VER896  TC       UPFLAG        QUITFLAG WILL CAUSE INTEGRATION TO EXIT
 0931  REF   1             43,3147    00221 0         ADRES    QUITFLAG          AT NEXT TIMESTEP
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 0932   REF  23  LAST  239   43,3150   3 4714 1          CAF     ZERO
 0933   REF  14  LAST  258   43,3151   0 4574 C          TC      POSTJUMP
 0934   REF   1               43,3152    10010 1        CADR    V37          GO TO P00

 0949   REF   5  LAST  206   E5,1751                      EBANK=  LANDMARK
 0950   REF   7  LAST  259   43,3153   0 5253 C  V52     TC      CHECKMM      IS P22 OPERATING
 0951                        43,3154    00026 C         MM      22
 0952   REF  18  LAST  259   43,3155   0 2124 1          TC      ALM/END      NO
 09521  REF   1               43,3156   3 3173 1        CAF     LANDBANK
 09522  REF  13  LAST  252   43,3157   54 003 C          TS      EBANK

 0953   REF   3  LAST  259   43,3160   4 4756 C          CS      PRIO7        YES  SET BITS 12,11,10 OF LANDMARK =
 0954   REF   6  LAST  260   43,3161   7 1751 1          MASK    LANDMARK          BITS 14,13,12 OF MARKSTAT AFTER
 0955   REF   7  LAST  260   43,3162   55'751 1          TS      LANDMARK          ADDING 1 TO THEM TO GET OFFSET
 0956   REF  25  LAST  226   43,3163   3 1330 C          CA      MARKSTAT          MARK NO.
 0957   REF   1               43,3164   54 021 C        TS      SR
 0958   REF   2  LAST  260   43,3165   3 0021 1          CA      SR
 0959   REF   3  LAST  260   43,3166   3 0021 1          CA      SR
 0960   REF   4  LAST  260   43,3167   7 4756 C          MASK    PRIO7
 0961   REF  19  LAST  224   43,3170   6 4701 C          AD      BIT10        ADD 1,MARKSTAT IS 1 LESS THAN MARK NO.
 0962   REF   8  LAST  260   43,3171   27'751 1          ADS     LANDMARK
 0963   REF  24  LAST  257   43,3172   0 2125 C          TC      GOPIN
 09631  REF   9  LAST  260   43,3173    02751 C  LANDBANK ECADR   LANDMARK
R2000
R20001  VERB 67  ASTRONAUT DISPLAY OF W MATRIX

 20002  REF  17  LAST  259   43,3174   0 2076 1  V67     TC      TESTXACT
 2001   REF   6  LAST  256   43,3175   3 4754 C          CAF     PRIO5
 2003   REF  12  LAST  259   43,3176   0 5042 1          TC      FINDVAC
 2004   REF   4  LAST   9C   E5,1400                      EBANK=  W
 2005   REF   1               43,3177    03571 1        2CADR   V67CALL
 2005   REF   1               43,3200    60105 C
 2006   REF  12  LAST  259   43,3201   0 5112 C          TC      ENDOFJOB
R2007   VB 44.   SET SURFACE FLAG.

 2008   REF  12  LAST  259   43,3202   0 5435 C  SETSURF  TC      UPFLAG
 2009   REF   2  LAST  203   43,3203    00177 C         ADRES   SURFFLAG
 2010   REF  25  LAST  26C   43,3204   1 2125 1          TCF     GOPIN

R2011   VB 45.    RESET SURFACE FLAG.

 2012   REF  17  LAST  259   43,3205   0 5447 C  RESTSRF  TC      DOWNFLAG
 2013   REF   3  LAST  26C   43,3206    00177 C         ADRES   SURFFLAG
 2014   REF  26  LAST  26C   43,3207   1 2125 1          TCF     GOPIN
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P1000 THE FOLLOWING REFERS TO THE NOUN TABLES

R1001 COMPONENT CODE NUMBER INTERPRETATION

R1002 00000 1 COMPONENT
R1003 00001 2 COMPONENT
R1004 00010 3 COMPONENT
R1005 X1XXX BIT4 = 1. DECIMAL ONLY
R1006 1XXXX BIT5 = 1. NO LOAD
R1007 END OF COMPONENT CODE NUMBERS

R1008 SF ROUTINE CODE NUMBER INTERPRETATION

R1009 00000 OCTAL ONLY
R1010 00001 STRAIGHT FRACTIONAL
R1011 00010 CDU DEGREES (XXX.XX)
R1012 00011 ARITHMETIC SF
R1013 00100 ARITH DP1 OUT(MULT BY 2EXP14 AT END) IN(STRAIGHT)
R1014 00101 ARITH DP2 OUT(STRAIGHT) IN(SL 7 AT END)
R1015 00110 Y OPTICS DEGREES (XX.XXX MAX 89.999)
R1016 00111 ARITH DP3 OUT (SL 7 AT END) IN (STRAIGHT)
R1017 01000 WHOLE HOURS IN R1, WHOLE MINUTES (MOD 60) IN R2,
R1018 SECONDS (MOD 60) OXX.XX IN R3. *** ALARMS IF USED WITH OCTAL
R1019 01001 MINUTES (MOD 60) IN D1C2, D3 BLANK, SECONDS (MOD 60) IN D4C5
R1020 LIMITS TO 59859 IF MAG EXCEEDS THIS VALUE.
R1021 ALARMS IF USED WITH OCTAL ******** IN (ALARM)
R1022 01010 ARITH DP4 OUT (STRAIGHT) IN (SL 3 AT END)
R10221 01011 ARITH1 SF OUT(MULT BY 2EXP14 AT END) IN(STRAIGHT)
R10222 01100 2 INTEGERS IN D1C2, D4C5, D3 BLANK.
R10223 ALARMS IF USED WITH OCTAL ******** IN (ALARM)
R1023 END OF SF ROUTINE CODE NUMBERS

R1024 SF CONSTANT CODE NUMBER INTERPRETATION

R1025 00000 WHOLE USE ARITH
R1026 00000 DP TIME SEC (XXX.XX SEC) USE ARITHDP1
R1027 00001 SPARE
R1028 00010 CDU DEGREES USE CDU DEGREES
R1029 00010 Y OPTICS DEGREES USE Y OPTICS DEGREES
R1030 00011 DP DEGREES (90) XX.XXX DEG USE ARITHDP3
R1031 00100 DP DEGREES (360) XXX.XX DEG USE ARITHDP4
R1032 00101 DEGREES (180) XXX.XX DEG USE ARITH
R1034 00110 WEIGHT2 (XXXXX. LBS) USE ARITH1
R1035 00111 POSITION5 (XXX.XX NAUTICAL MILES)
R10351 USE ARITHDP3
R1037 01000 POSITION4 (XXXX.X NAUTICAL MILES)
R10371 USE ARITHDP3

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R1038   01001                   VELOCITY2 (XXXXX. FT/SEC)    USE ARITHDP4
R1039   01010                   VELOCITY3 (XXXX.X FT/SEC)    USE ARITHDP3
R1040   01011                   ELEVATION DEGREES(89.999MAX) USE ARITH
R10401  01100                   TRIM DEGREES (XXX.XX DEG)    USE ARITH
R10402  01101                   INERTIA (XXXXXBB. SLUG FT FT)  USE ARITH
R10402S 01101                   THRUST MOMENT (XXXXXBB.FT LBS) USE ARITH
R10403  01110                   VELOCITY/2VS (XXXXX. FT/SEC)USE ARITHDP4
R10404  01111                   POSITION6 (XXXX.X NAUT MI)   USE ARITHDP3
R10405  10000                   DRAG ACCELERATION (XXX.XX G)USE ARITHDP2
R10406  10001                   POSITION8 (XXXX.X NAUT MI)   USE ARITHDP3
R10407  10010                   POSITION9 (XXX.XX NAUT MI)   USE ARITHDP4
R10408  10011                   VELOCITY4 (XXXX.X FT/SEC)    USE ARITHDP2
R1041   END OF SF CONSTANT CODE NUMBERS


R1042   FOR GREATER THAN SINGLE PRECISION SCALES, PUT ADDRESS OF MAJOR PART INTO
R1043   NOUN TABLES.
R1044   OCTAL LOADS PLACE +0 INTO MAJOR PART, DATA INTO MINOR PART.
R1045   OCTAL DISPLAYS SHOW MINOR PART ONLY.
R1046   TO GET AT BOTH MAJOR AND MINOR PARTS(IN OCTAL), USE NOUN 01.


R1047   A NOUN MAY BE DECLARED :DECIMAL ONLY: BY MAKING BIT4=1 OF ITS COMPONENT
R1048   CODE NUMBER. IF THIS NOUN IS USED WITH ANY OCTAL DISPLAY VERB, OR IF
R1049   DATA IS LOADED IN OCTAL, IT ALARMS.

R1050   IN LOADING AN :HOURS, MINUTES, SECONDS: NOUN, ALL 3 WORDS MUST BE
R1051   LOADED, OR ALARM.
R1052   ALARM IF AN ATTEMPT IS MADE TO LOAD :SPLIT MINUTES/SECONDS: (MMBSS).
R1053   THIS IS USED FOR DISPLAY ONLY.
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P1054 THE FOLLOWING ROUTINES ARE FOR READING THE NOUN TABLES AND THE SF TABLES
R1055 (WHICH ARE IN A SEPARATE BANK FROM THE REST OF PINBALL). THESE READING
R1056 ROUTINES ARE IN THE SAME BANK AS THE TABLES. THEY ARE CALLED BY DXCH Z.

R1057 LODNNTAB LOADS NNADTEM WITH THE NNADTAB ENTRY, NNTYPTEM WITH THE
R1058 NNTYPTAB ENTRY. IF THE NOUN IS MIXED, IDAD1TEM IS LOADED WITH THE FIRST
R1059 IDADDTAB ENTRY, IDAD2TEM THE SECOND IDADDTAB ENTRY, IDAD3TEM THE THIRD
R1060 IDADDTAB ENTRY, RUTMXTEM WITH THE RUTMXTAB ENTRY. MIXBR IS SET FOR
R1061 MIXED OR NORMAL NOUN.

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1200                          06,3262                    BANK   06
120001 REF   1                42,2000                    SETLOC PINBALL3
120002                        42,2062                    BANK

12001  REF   1                                          COUNT  42/NOUNS

1201   REF   1                42,2062  52 152 C  LODNNTAB DXCH   IDAD2TEM      SAVE RETURN INFO IN IDAD2TEM, IDAD3TEM.
1202   REF   3  LAST  232     42,2063  51'002 1           INDEX  NOUNREG
1203   REF   1                42,2064  3 2133 1           CAF    NNADTAB
1204   REF   1                42,2065  54 146 C           TS     NNADTEM
1205   REF   4  LAST  263     42,2066  51'002 1           INDEX  NOUNREG
1206   REF   1                42,2067  3 2277 1           CAF    NNTYPTAB
1207   REF   1                42,2070  54 147 1           TS     NNTYPTEM
1208   REF   5  LAST  263     42,2071  4 1002 C           CS     NOUNREG
1209   REF   1                42,2072  6 4726 C           AD     MIXCON
1210                          42,2073  0 0006 1           EXTEND
1211   REF   1                42,2074  6 2100 1           BZMF   LODMIXNN      NOUN NUMBER G/E FIRST MIXED NOUN
1212   REF  12  LAST  235     42,2075  3 4712 1           CAF    ONE           NOUN NUMBER L/ FIRST MIXED NOUN
1213   REF   1                42,2076  54 140 C           TS     MIXBR         NORMAL.  +1 INTO MIXBR.
1214   REF   1                42,2077  0 2116 C           TC     LODNLV
1215   REF   5  LAST  242     42,2100  3 4711 1  LODMIXNN CAF    TWO           MIXED.  +2 INTO MIXBR.
1216   REF   2  LAST  263     42,2101  54 140 C           TS     MIXBR
1217   REF   6  LAST  263     42,2102  51'002 1           INDEX  NOUNREG
1218   REF   1                42,2103  3 2777 1           CAF    RUTMXTAB -40D FIRST MIXED NOUN = 40.
1219   REF   1                42,2104  54 153 1           TS     RUTMXTEM
1220   REF   3  LAST  197     42,2105  3 4747 1           CAF    LOW10
1221   REF   2  LAST  263     42,2106  7 0146 C           MASK   NNADTEM
1222   REF  30  LAST  254     42,2107  54 002 1           TS     Q             TEMP
1223   REF  69  LAST  246     42,2110  5C 000 1           INDEX  A
1224   REF   1                42,2111  3 2563 C           CAF    IDADDTAB
1225   REF   1                42,2112  54 150 1           TS     IDAD1TEM      LOAD IDAD1TEM WITH FIRST IDADDTAB ENTRY
1226                          42,2113  0 0006 1           EXTEND
1227   REF  31  LAST  263     42,2114  5 0002 C           INDEX  Q             LOAD IDAD2TEM WITH 2ND IDADDTAB ENTRY
1228   REF   2  LAST  263     42,2115  3 2565 C           DCA    IDADDTAB +1   LOAD IDAD3TEM WITH 3RD IDADDTAB ENTRY.
1229   REF   2  LAST  263     42,2116  52 152 C  LODNLV   DXCH   IDAD2TEM      PUT RETURN INFO INTO A, L.
1230   REF   1                42,2117  52 006 C           DXCH   Z

1231   REF   2  LAST  242        4726                 MIXCON =      OCT50       FIRST MIXED NOUN =40.  (DEC 40)
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R1232 G1SFCLT LOADS SFTEMP1, SFTEMP2 WITH THE DP SFOUTAB ENTRIES.

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1233   REF   1              42,2120  52 124 1  GTSFOUT  DXCH   SFTEMP1      2X(SFCONUM) ARRIVES IN SFTEMP1.
1234                        42,2121  C 0006 1            EXTEND
1235   REF  70  LAST  263   42,2122  5 0000 1            INDEX  A
1236   REF   1              42,2123  3 2514 C            DCA    SFOUTAB
1237   REF   2  LAST  264   42,2124  52 124 1  SFCOM     DXCH   SFTEMP1
1238   REF   2  LAST  263   42,2125  52 006 C            DXCH   Z

R1239  GTSFIN LOADS SFTEMP1, SFTEMP2 WITH THE DP SFINTAB ENTRIES.

1240   REF   3  LAST  264   42,2126  52 124 1  GTSFIN   DXCH   SFTEMP1      2X(SFCONUM) ARRIVES IN SFTEMP1.
1241                        42,2127  C 0006 1            EXTEND
1242   REF  71  LAST  264   42,2130  5 0000 1            INDEX  A
1243   REF   1              42,2131  3 2444 1            DCA    SFINTAB
1244   REF   1              42,2132  1 2124 C            TCF    SFCOM


A1400                                                                NN  NORMAL NOUNS
1401                        42,2133   00000 1  NNADTAB  OCT    00000        00 NOT IN USE
1402                        42,2134   40000 C            OCT    40000        01 SPECIFY MACHINE ADDRESS (FRACTIONAL)
1403                        42,2135   40000 C            OCT    40000        02 SPECIFY MACHINE ADDRESS (WHOLE)
1404                        42,2136   40000 C            OCT    40000        03 SPECIFY MACHINE ADDRESS (DEGREES)
1405                        42,2137   00000 1            OCT    0            04 SPARE
1406   REF   3  LAST  226   42,2140   01045 1            ECADR  DSPTEM1      05 ANGULAR ERROR/DIFFERENCE
1407   REF   1              42,2141   01131 C            ECADR  OPTION1      06 OPTION CODE
1408   REF   1              42,2142   01003 C            ECADR  XREG         07 ECADR OF WORD TO BE MODIFIED
A14081                                                                          ONES FOR BITS TO BE MODIFIED
A14082                                                                          1 TO SET OR 0 TO RESET SELECTED BITS
1409   REF   2  LAST   79   42,2143   01363 C            ECADR  ALMCADR      08 ALARM DATA
1410   REF   4  LAST  178   42,2144   00375 0            ECADR  FAILREG      09 ALARM CODES
1411                        42,2145   77776 1            OCT    77776        10 CHANNEL TO BE SPECIFIED
1412                        42,2146   00000 1            OCT    00000        11 SPARE
1413   REF   1              42,2147   01051 1            ECADR  OPTIONX      12 OPTION CODE
A14131                                                                              (USED BY EXTENDED VERBS ONLY)
1414                        42,2150   00000 1            OCT    00000        13 SPARE
1415                        42,2151   00000 1            OCT    0            14 SPARE
1416                        42,2152   77777 C            OCT    77777        15 INCREMENT MACHINE ADDRESS
1417   REF   2  LAST   73   42,2153   01051 1            ECADR  DSPTEMX      16 TIME OF EVENT (HRS,MIN,SEC)
1418   REF   3  LAST  237   42,2154   01333 C            ECADR  CPHIX        17 ASTRONAUT TOTAL ATTITUDE
1419   REF   7  LAST  243   42,2155   01155 1            ECADR  THETAD       18 AUTO MANEUVER BALL ANGLES
1420   REF   8  LAST  264   42,2156   01155 1            ECADR  THETAD       19 BYPASS ATTITUDE TRIM MANEUVER
1421   REF   5  LAST  237   42,2157   00032 C            ECADR  CDUX         20 ICDU ANGLES
1422   REF   1              42,2160   00037 C            ECADR  PIPAX        21 PIPAS
1423   REF   9  LAST  264   42,2161   01155 1            ECADR  THETAD       22 NEW ICDU ANGLES
1424                        42,2162   00000 1            OCT    00000        23 SPARE
1425   REF   3  LAST  239   42,2163   01051 1            ECADR  DSPTEM2 +1   24 DELTA TIME FOR AGC CLOCK(HRS,MIN,SEC)
1426   REF   4  LAST  264   42,2164   01045 1            ECADR  DSPTEM1      25 CHECKLIST
A14261                                                                              (USED WITH PLEASE PERFORM ONLY)
1427   REF   5  LAST  264   42,2165   01045 1            ECADR  DSPTEM1      26 PRIO/DELAY, ADRES, BBCON
1428   REF   4  LAST  256   42,2166   01362 1            ECADR  SMODE        27 SELF TEST ON/OFF SWITCH
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 1429                                  42,2167   00000 1        OCT     0          28 SPARE
 1430   REF   6  LAST  264             42,2170   01045 1        ECADR   DSPTEM1    29 XSM LAUNCH AZIMUTH
 1431   REF   7  LAST  265             42,2171   01045 1        ECADR   DSPTEM1    30 TARGET CODES
 1432   REF   8  LAST  269             42,2172   01045 1        ECADR   DSPTEM1    31 TIME OF LANDING SITE (HRS,MIN,SEC)
 1433   REF   2  LAST   88             42,2173   02345 1        ECADR   -TPER      32 TIME TO PERIGEE (HRS,MIN,SEC)
 1434   REF  15  LAST  212             42,2174   03412 0        ECADR   TIG        33 TIME OF IGNITION (HRS,MIN(SEC)
 1435   REF   9  LAST  265             42,2175   01045 1        ECADR   DSPTEM1    34 TIME OF EVENT (HRS,MIN,SEC)
 1436   REF   3  LAST  211             42,2176   03660 1        ECADR   TTOGO      35 TIME TO GO TO EVENT (HRS,MIN,SEC)
 1437   REF   9  LAST  239             42,2177   00024 1        ECADR   TIME2      36 TIME OF AGC CLOCK (HRS,MIN,SEC)
 1438   REF   3  LAST  170             42,2200   03662 0        ECADR   TTPI       37 TIG OF TPI (HRS,MIN,SEC)
 1439   REF   2  LAST   82             42,2201   01516 1        ECADR   TET        38 TIME OF STATE VECTOR
 1440   REF   1                        42,2202   02640 1        ECADR   T3TOT4     39 DELTA TIME TO TRANSFER (HRS,MIN,SEC)
R14401  END OF NNADTAB FOR NORMAL NOUNS


A14402                                                                              NN  MIXED NOUNS
 1441                                  42,2203   64000 0        OCT     64000      40 TIME TO IGNITION/CUTOFF
A14411                                                                                 VG
A14412                                                                                 DELTA V (ACCUMULATED)
 1442                                  42,2204   02003 0        OCT     02003      41 TARGET  AZIMUTH
A14421                                                                                        ELEVATION
 1443                                  42,2205   24006 1        OCT     24006      42 APOGEE
A14431                                                                                 PERIGEE
A14432                                                                                 DELTA V (REQUIRED)
 1444                                  42,2206   24011 1        OCT     24011      43 LATITUDE
A14441                                                                                 LONGITUDE
A14442                                                                                 ALTITUDE
 1445                                  42,2207   64014 0        OCT     64014      44 APOGEE
A14451                                                                                 PERIGEE
A14452                                                                                 TFF
 1446                                  42,2210   64017 0        OCT     64017      45 MARKS (VHF - OPTICS)
A14461                                                                                 TTI OF NEXT BURN
A14462                                                                                 MGA
 1447                                  42,2211   02022 0        OCT     02022      46 AUTOPILOT CONFIGURATION
 1448                                  42,2212   22025 0        OCT     22025      47 THIS VEHICLE WEIGHT
A14481                                                                                 OTHER VEHICLE WEIGHT
 1449                                  42,2213   22030 1        OCT     22030      48 PITCH TRIM
A14491                                                                                 YAW TRIM
 1450                                  42,2214   24033 1        OCT     24033      49 DELTA R
A14501                                                                                 DELTA V
A14502                                                                                 VHF OR OPTICS CODE
 1451                                  42,2215   64036 0        OCT     64036      50 SPLASH ERROR
A14511                                                                                 PERIGEE
A14512                                                                                 TFF
 1452                                  42,2216   22041 1        OCT     22041      51 S-BAND ANTENNA PITCH
A14521                                                                                                YAW
 1453                                  42,2217   00044 1        OCT     00044      52 CENTRAL ANGLE OF ACTIVE VEHICLE
 1454                                  42,2220   24047 1        OCT     24047      53 RANGE
A14541                                                                                 RANGE RATE
A14542                                                                                 PHI
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 1455                42,2221   24052 C        OCT    24052        54 RANGE
A14551                                                              RANGE RATE
A14552                                                              THETA
 1458                42,2222   24055 1        OCT    24055        55 PERIGEE CODE
A14581                                                              ELEVATION ANGLE
A14582                                                              CENTRAL ANGLE
 1459                42,2223   22060 1        OCT    22060        56 REENTRY ANGLE,
A14591                                                              DELTA V
 1460                42,2224   20063 C        OCT    20063        57 DELTA R
 1461                42,2225   24066 1        OCT    24066        58 PERIGEE ALT
A14611                                                              DELTA V TPI
A14612                                                              DELTA V TPF
 1462                42,2226   24071 1        OCT    24071        59 DELTA VELOCITY LOS
 1463                42,2227   24074 1        OCT    24074        60 GMAX
A14631                                                              VPRED
A14632                                                              GAMMA EI
 1464                42,2230   24077 1        OCT    24077        61 IMPACT LATITUDE
A14641                                                              IMPACT LONGITUDE
A14642                                                              HEADS UP/DOWN
 1465                42,2231   24102 1        OCT    24102        62 INERTIAL VEL MAG (VI)
A14651                                                              ALT RATE CHANGE (HDOT)
A14652                                                              ALT ABOVE PAD RADIUS (H)
 1466                42,2232   64105 1        OCT    64105        63 RANGE  297,431 TO SPLASH (RTGO)
A14661                                                              PREDICTED INERT VEL (VIO)
A14662                                                              TIME TO GO TO 297,431 (TTE)
 1467                42,2233   24110 1        OCT    24110        64 DRAG ACCELERATION
A14671                                                              INERTIAL VELOCITY (VI)
A14672                                                              RANGE TO SPLASH
 1468                42,2234   24113 1        OCT    24113        65 SAMPLED AGC TIME (HRS,MIN,SEC)
A14681                                                              (FETCHED IN INTERRUPT)
 1470                42,2235   24116 1        OCT    24116        66 COMMAND BANK ANGLE (BETA)
A14701                                                              CROSS RANGE ERROR
A14702                                                              DOWN RANGE ERROR
 1471                42,2236   24121 C        OCT    24121        67 RANGE TO TARGET
A14711                                                              PRESENT LATITUDE
A14712                                                              PRESENT LONGITUDE
 1472                42,2237   24124 C        OCT    24124        68 COMMAND BANK ANGLE (BETA)
A14721                                                              INERTIAL VELOCITY (VI)
A14722                                                              ALT RATE CHANGE (RDOT)
 1473                42,2240   24127 C        OCT    24127        69 BETA
A14731                                                              DL
A14732                                                              VL
 1474                42,2241   04132 0        OCT    04132        70 STAR CODE
A14741                                                              LANDMARK DATA
A14742                                                              HORIZON DATA
 1475                42,2242   04135 1        OCT    04135        71 STAR CODE
A14751                                                              LANDMARK
A14752                                                              HORIZON
 1476                42,2243   24140 1        OCT    24140        72 DELT ANG
A14761                                                              DELT ALT
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A14762                                                    SEARCH OPTION
 1477          42,2244   00000 1          OCT    0       73 SPARE
 1478          42,2245   00000 1          OCT    0       74 SPARE
 1479          42,2246   00000 1          OCT    0       75 SPARE
 1480          42,2247   00000 1          OCT    0       76 SPARE
 1481          42,2250   00000 1          OCT    0       77 SPARE
 1482          42,2251   00000 1          OCT    0       78 SPARE
 1483          42,2252   00000 1          OCT    0       79 SPARE
 1484          42,2253   64170 0          OCT    64170   80 TIME TO IGNITION/CUTOFF
A14841                                                    VG
A14842                                                    DELTA V (ACCUMULATED)
 1485          42,2254   24173 1          OCT    24173   81 DELTA V (LV)
 1486          42,2255   00000 1          OCT    00000   82 SPARE
 1487          42,2256   24201 1          OCT    24201   83 DELTA V (BODY)
 1488          42,2257   24204 1          OCT    24204   84 DELTA V (OTHER VEHICLE)
 1489          42,2260   24207 1          OCT    24207   85 VG (BODY)
 1490          42,2261   24212 0          OCT    24212   86 DELTA V (LV)
 1491          42,2262   02215 0          OCT    02215   87 MARK DATA  SHAFT
A14911                                                                 TRUNION
 1492          42,2263   24220 1          OCT    24220   88 HALF UNIT SUN OR PLANET VECTOR
 1493          42,2264   24223 1          OCT    24223   89 LANDMARK  LATITUDE
A14931                                                                 LONGITUDE/2
A14932                                                                 ALTITUDE
 1494          42,2265   24226 1          OCT    24226   90 Y
A14941                                                    Y DOT
A14942                                                    PSI
 1495          42,2266   02231 0          OCT    02231   91 OCDU ANGLES  SHAFT
A14951                                                                 TRUNION
 1496          42,2267   02234 0          OCT    02234   92 NEW OPTICS ANGLES  SHAFT
A14961                                                                 TRUNION
 1497          42,2270   04237 0          OCT    04237   93 DELTA GYRO ANGLES
 1498          42,2271   02242 1          OCT    02242   94 NEW OPTICS ANGLES  SHAFT
A14981                                                                 TRUNNION
 1499          42,2272   04245 0          OCT    04245   95 PREFERRED ATTITUDE ICDU ANGLES
 1500          42,2273   04250 1          OCT    04250   96 +X-AXIS ATTITUDE ICDU ANGLES
 1501          42,2274   04253 1          OCT    04253   97 SYSTEM TEST INPUTS
 1502          42,2275   04256 1          OCT    04256   98 SYSTEM TEST RESULTS
 1503          42,2276   24261 1          OCT    24261   99 RMS IN POSITION
A15031                                                    RMS IN VELOCITY
A15032                                                    RMS OPTION
R1504   END OF NNADTAB FOR MIXED NOUNS


A1800                                                     NN        NORMAL NOUNS
 1801          42,2277   00000 1  NNTYPTAB OCT    00000   00 NOT IN USE
 1802          42,2300   04040 1          OCT    04040   01 3COMP  FRACTIONAL
 1803          42,2301   04140 0          OCT    04140   02 3COMP  WHOLE
 1804          42,2302   04102 0          OCT    04102   03 3COMP  CDU DEGREES
 1805          42,2303   00000 1          OCT    0       04 SPARE
 1806          42,2304   00504 0          OCT    00504   05 ICOMP  DPDEG(360)
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1807                    42,2305   02000 0     OCT   02000       06 2COMP  OCTAL ONLY
1808                    42,2306   04000 0     OCT   04000       07 3COMP  OCTAL ONLY
1809                    42,2307   04000 0     OCT   04000       08 3COMP  OCTAL ONLY
1810                    42,2310   04000 0     OCT   04000       09 3COMP  OCTAL ONLY
1811                    42,2311   00000 1     OCT   00000       10 1COMP  OCTAL ONLY
1812                    42,2312   00000 1     OCT   00000       11        SPARE
1813                    42,2313   02000 0     OCT   02000       12 2COMP  OCTAL ONLY
1814                    42,2314   00000 1     OCT   00000       13        SPARE
1815                    42,2315   00000 1     OCT   0           14 SPARE
1816                    42,2316   00000 1     OCT   00000       15 1COMP  OCTAL ONLY
1817                    42,2317   24400 0     OCT   24400       16 3COMP  HMS (DEC ONLY)
1818                    42,2320   04102 0     OCT   04102       17 3COMP  CDU DEG
1819                    42,2321   04102 0     OCT   04102       18 3COMP  CDU DEG
1820                    42,2322   04102 0     OCT   04102       19 3COMP  CDU DEG
1821                    42,2323   04102 0     OCT   04102       20 3COMP  CDU DEGREES
1822                    42,2324   04140 0     OCT   04140       21 3COMP  WHOLE
1823                    42,2325   04102 0     OCT   04102       22 3COMP  CDU DEGREES
1824                    42,2326   00000 1     OCT   00000       23        SPARE
1825                    42,2327   24400 0     OCT   24400       24 3COMP  HMS (DEC ONLY)
1826                    42,2330   04140 0     OCT   04140       25 3COMP  WHOLE
1827                    42,2331   04000 0     OCT   04000       26 3COMP  OCTAL ONLY
1828                    42,2332   00140 1     OCT   00140       27 1COMP  WHOLE
1829                    42,2333   00000 1     OCT   0           28        SPARE
1830                    42,2334   20102 0     OCT   20102       29 1COMP  CDU DEG (DEC ONLY)
1831                    42,2335   04140 0     OCT   04140       30 3COMP  WHOLE
1832                    42,2336   24400 0     OCT   24400       31 3COMP  HMS (DEC ONLY)
1833                    42,2337   24400 0     OCT   24400       32 3COMP  HMS (DEC ONLY)
1834                    42,2340   24400 0     OCT   24400       33 3COMP  HMS (DEC ONLY)
1835                    42,2341   24400 0     OCT   24400       34 3COMP  HMS (DEC ONLY)
1836                    42,2342   24400 0     OCT   24400       35 3COMP  HMS (DEC ONLY)
1837                    42,2343   24400 0     OCT   24400       36 3COMP  HMS (DEC ONLY)
1838                    42,2344   24400 0     OCT   24400       37 3COMP  HMS (DEC ONLY)
1839                    42,2345   24400 0     OCT   24400       38 3COMP  HMS (DEC ONLY)
1840                    42,2346   24400 0     OCT   24400       39 3COMP  HMS (DEC ONLY)
R18401  END OF NNTYPTAB FOR NORMAL NOUNS


A18402                                                          NN   MIXED NOUNS
1841                    42,2347   24500 1     OCT   24500       40 3COMP  MIN/SEC, VEL3, VEL3
A18411                                                                    (NO LOAD, DEC ONLY)
1842                    42,2350   00542 1     OCT   00542       41 2COMP  CDU DEG, ELEV DEG
1843                    42,2351   24410 1     OCT   24410       42 3COMP  POS4, POS4, VEL3
A18431                                                                    (DEC ONLY)
1844                    42,2352   20204 0     OCT   20204       43 3COMP  DPDEG(360), DPDEG(360), POS4
A18441                                                                    (DEC ONLY)
1845                    42,2353   00410 1     OCT   00410       44 3COMP  POS4, POS4, MIN/SEC
A18451                                                                    (NO LOAD, DEC ONLY)
1846                    42,2354   10000 0     OCT   10000       45 3COMP  2INT, MIN/SEC, DPDEG(360)
A18461                                                                    (NO LOAD, DEC ONLY)
1847                    42,2355   00000 1     OCT   00000       46 2COMP  OCTAL ONLY FOR EACH
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 1848                 42,2356   00306 1        OCT    00306        47 2COMP  WEIGHT2 FOR EACH
A18481                                                                        (DEC ONLY)
 1849                 42,2357   00614 1        OCT    00614        48 2COMP  TRIM DEG, TRIM DEG
A18491                                                                        (DEC ONLY)
 1850                 42,2360   00510 0        OCT    00510        49 3COMP  POS4, VEL3, WHOLE
A18501                                                                        (DEC ONLY)
 1851                 42,2361   00417 0        OCT    00417        50 3COMP  POS6, POS4, MIN/SEC
A18511                                                                        (NO LOAD, DEC ONLY)
 1852                 42,2362   00204 1        OCT    00204        51 2COMP  DPDEG(360), DPDEG(360)
A18521                                                                        (DEC ONLY)
 1853                 42,2363   00004 0        OCT    00004        52 1COMP  DPDEG(360)
 1854                 42,2364   10507 1        OCT    10507        53 3COMP  POS5, VEL3, DPDEG(360)
A18541                                                                        (DEC ONLY)
 1855                 42,2365   10507 1        OCT    10507        54 3COMP  POS5, VEL3, DPDEG(360)
A18551                                                                        (DEC ONLY)
 1858                 42,2366   10200 1        OCT    10200        55 3COMP  WHOLE, DPDEG(360), DPDEG(360)
A18581                                                                        (DEC ONLY)
 1859                 42,2367   00444 0        OCT    00444        56 2COMP  DPDEG(360), VEL2
A18591                                                                        (DEC ONLY)
 1860                 42,2370   00010 0        OCT    00010        57 1COMP  POS4
A18601                                                                        (DEC ONLY)
 1861                 42,2371   24510 0        OCT    24510        58 3COMP  POS4, VEL3, VEL3
A18611                                                                        (DEC ONLY)
 1862                 42,2372   24512 1        OCT    24512        59 3COMP  VEL3 FOR EACH
A18621                                                                        (DEC ONLY)
 1863                 42,2373   10440 0        OCT    10440        60 3COMP  WHOLE, VEL2, DPDEG(360)
A18631                                                                        (DEC ONLY)
 1864                 42,2374   00204 1        OCT    00204        61 3COMP  DPDEG(360), DPDEG(360), WHOLE
A18641                                                                        (DEC ONLY)
 1865                 42,2375   20451 0        OCT    20451        62 3COMP  VEL2, VEL2, POS4
A18651                                                                        (DEC ONLY)
 1866                 42,2376   00457 1        OCT    00457        63 3COMP  POS6, VEL2, MIN/SEC
A18661                                                                        (NO LOAD, DEC ONLY)
 1867                 42,2377   36460 0        OCT    36460        64 3COMP  DRAG ACCEL, VEL2, POS6
A18671                                                                        (DEC ONLY)
 1868                 42,2400   00000 1        OCT    00000        65 3COMP  HMS (DEC ONLY)
 1869                 42,2401   37044 0        OCT    37044        66 3COMP  DPDEG(360), POS8, POS6
A18691                                                                        (DEC ONLY)
 1870                 42,2402   10217 1        OCT    10217        67 3COMP  POS6, DPDEG(360), DPDEG(360)
A18701                                                                        (DEC ONLY)
 1871                 42,2403   34444 1        OCT    34444        68 3COMP  DPDEG(360), VEL2, VEL/2VS
A18711                                                                        (DEC ONLY)
 1872                 42,2404   35004 0        OCT    35004        69 3COMP  DPDEG(360), DRAG ACCEL,VEL/2VS
A18721                                                                        (DEC ONLY)
 1873                 42,2405   00000 1        OCT    00000        70 3COMP  OCTAL ONLY FOR EACH
 1874                 42,2406   00000 1        OCT    0            71 3COMP  OCTAL ONLY FOR EACH
 1875                 42,2407   00404 1        OCT    00404        72 3COMP  DPDEG(360), POS4, WHOLE
A18751                                                                        (DEC ONLY)
 1876                 42,2410   00000 1        OCT    0            73        SPARE
 1877                 42,2411   00000 1        OCT    0            74        SPARE
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 1878                 42,2412   00000 1        OCT     0          75          SPARE
 1879                 42,2413   00000 1        OCT     0          76          SPARE
 1880                 42,2414   00000 1        OCT     0          77          SPARE
 1881                 42,2415   00000 1        OCT     0          78          SPARE
 1882                 42,2416   00000 1        OCT     0          79          SPARE
 1883                 42,2417   22440 1        OCT     22440      80 3COMP    MIN/SEC, VEL2, VEL2
A18831                                                                       (NO LOAD, DEC ONLY)
 1884                 42,2420   24512 1        OCT     24512      81 3COMP    VEL3 FOR EACH
A18841                                                                       (DEC CNLY)
 1885                 42,2421   00000 1        OCT     00000      82          SPARE
 1886                 42,2422   24512 1        OCT     24512      83 3COMP    VEL3 FOR EACH
A18861                                                                       (DEC CNLY)
 1887                 42,2423   24512 1        OCT     24512      84 3COMP    VEL3 FOR EACH
A18871                                                                       (DEC CNLY)
 1888                 42,2424   24512 1        OCT     24512      85 3COMP    VEL3 FOR EACH
A18881                                                                       (DEC CNLY)
 1889                 42,2425   22451 1        OCT     22451      86 3COMP    VEL2 FOR EACH
A18891                                                                       (DEC CNLY)
 1890                 42,2426   00102 1        OCT     00102      87 2COMP    CDU DEG, Y OPTICS DEG
 1891                 42,2427   00000 1        OCT     0          88 3COMP    FRAC FOR EACH
A18912                                                                        (DEC ONLY)
 1892                 42,2430   16143 0        OCT     16143      89 3COMP    DPDEG(90), DPDEG(90), POS5
A18921                                                                       (DEC ONLY)
 1893                 42,2431   10507 1        OCT     10507      90 3COMP    POS5, VEL3, DPDEG(360)
A18931                                                                       (DEC CNLY)
 1894                 42,2432   00102 1        OCT     00102      91 2COMP    CDU DEG, Y OPTICS DEG
 1895                 42,2433   00102 1        OCT     00102      92 2COMP    CDU DEG, Y OPTICS DEG
 1896                 42,2434   06143 1        OCT     06143      93 3COMP    DPDEG(90) FOR EACH
 1897                 42,2435   00102 1        OCT     00102      94 2COMP    CDU DEG, Y OPTICS DEG
 1898                 42,2436   04102 0        OCT     04102      95 3COMP    CDU DEG FOR EACH
 1899                 42,2437   04102 0        OCT     04102      96 3COMP    CDU DEG FOR EACH
 1900                 42,2440   00000 1        OCT     00000      97 3COMP    WHOLE FOR EACH
 1901                 42,2441   00000 1        OCT     00000      98 3COMP    WHOLE, FRAC, WHOLE
 1902                 42,2442   01162 0        OCT     01162      99 3COMP POS9, VEL4, WHOLE
A19021                                                                       (DEC CNLY)
R1903   END OF NNTYPTAB FOR MIXED NOUNS


 2200                 42,2443   00006 1  SFINTAB  OCT     00006          WHOLE, DP TIME (SEC)
 2201                 42,2444   03240 1           OCT     03240
 2202                 42,2445   00000 1           OCT     00000          SPARE
 2203                 42,2446   00000 1           OCT     00000
 2204                 42,2447   00000 1           OCT     00000          CDU DEGREES, Y OPTICS DEGREES
 2205                 42,2450   00000 1           OCT     00000             (SFCONS IN DEGINSF, OPTDEGIN)
 2206                 42,2451   10707 0           OCT     10707          DP DEGREES (90)
 2207                 42,2452   03435 0           OCT     03435                 UPPED BY 1
 2208                 42,2453   13070 1           OCT     13070          DP DEGREES (360)(POINT BETWN BITS 11-12)
 2209                 42,2454   34345 1           OCT     34345                 UPPED BY 1
 2210                 42,2455   00005 1           OCT     00005          DEGREES (180)
 2211                 42,2456   21616 0           OCT     21616
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2212                42,2457   26113 C          OCT    26113          WEIGHT2
2213                42,2460   31713 C          OCT    31713
2214                42,2461   00070 C          OCT    00070          POSITION5
2215                42,2462   20460 1          OCT    20460
2216                42,2463   01065 C          OCT    01065          POSITION4
2217                42,2464   05740 1          OCT    05740
2218                42,2465   11414 C          OCT    11414          VELOCITY2       (POINT BETWN BITS 11-12)
2219                42,2466   31463 1          OCT    31463
2220                42,2467   07475 C          OCT    07475          VELOCITY3
2221                42,2470   16051 1          OCT    16051
2222                42,2471   00001 C          OCT    00001          ELEVATION DEGREES
2223                42,2472   03434 1          OCT    03434
2224                42,2473   00002 C          OCT    00002          TRIM DEGREES
2225                42,2474   22245 1          OCT    22245
2226                42,2475   00014 1          OCT    00014          INERTIA, THRUST MOMENT
2227                42,2476   35607 C          OCT    35607
2228                42,2477   07606 C          OCT    07606          VELOCITY/2VS
2229                42,2500   06300 1          OCT    06300
2230                42,2501   16631 1          OCT    16631          POSITION 6
2231                42,2502   11307 C          OCT    11307
2232                42,2503   12000 1          OCT    12000          DRAG ACCELERATION (POINT BETWN BITS 7-8)
2233                42,2504   00000 1          OCT    00000
2234                42,2505   27176 1          OCT    27176          POSITION 8
2235                42,2506   14235 C          OCT    14235
2236                42,2507   16102 C          2DEC   1852 E3 B-22   POSITION9
2236                42,2510   14000 1
2237                42,2511   07475 C          2DEC   30.48 B-7      VELOCITY4
2237                42,2512   16051 1
A2290                                                                 END OF SFINTAB


2300                42,2513   05174 C  SFOUTAB  OCT    05174          WHOLE, DP TIME (SEC)
2301                42,2514   13261 C          OCT    13261
2302                42,2515   00000 1          OCT    00000          SPARE
2303                42,2516   00000 1          OCT    00000
2304                42,2517   00000 1          OCT    00000          CDU DEGREES, Y OPTICS DEGREES
2305                42,2520   00000 1          OCT    00000             (SFCONS IN DEGOUTSF, OPTDEGOUT)
2306                42,2521   00714 C          OCT    00714          DP DEGREES (90) (POINT BETWN BITS 7-8)
2307                42,2522   31463 1          OCT    31463
2308                42,2523   13412 1          OCT    13412          DP DEGREES (360)
2309                42,2524   07534 1          OCT    07534
2310                42,2525   05605 1          OCT    05605          DEGREES (180)
2311                42,2526   03656 1          OCT    03656
2312                42,2527   00001 C          OCT    00001          WEIGHT2
2313                42,2530   16170 C          OCT    16170
2314                42,2531   00441 C          OCT    00441          POSITION5
2315                42,2532   34306 C          OCT    34306
2316                42,2533   07176 C          OCT    07176          POSITION4
2317                42,2534   21603 1          OCT    21603
2318                42,2535   15340 1          OCT    15340          VELOCITY2
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2319                    42,2536  15340 1        OCT     15340
2320                    42,2537  01031 1        OCT     01031          VELOCITY3       (POINT BETWN BITS 7-8)
2321                    42,2540  21032 0        OCT     21032
2322                    42,2541  34631 1        OCT     34631          ELEVATION DEGREES
2323                    42,2542  23146 0        OCT     23146
2324                    42,2543  14340 0        OCT     14340          TRIM DEGREES
2325                    42,2544  24145 1        OCT     24145
2326                    42,2545  02363 0        OCT     02363          INERTIA, THRUST MOMENT
2327                    42,2546  03721 0        OCT     03721
2328                    42,2547  20373 1        OCT     20373          VELOCITY/2VS
2329                    42,2550  02122 1        OCT     02122
2330                    42,2551  00424 0        OCT     00424          POSITION 6      (POINT BETWN BITS 7-8)
2331                    42,2552  30446 1        OCT     30446
2332                    42,2553  00631 0        OCT     00631          DRAG ACCELERATION
2333                    42,2554  23146 0        OCT     23146
2334                    42,2555  00260 0        OCT     00260          POSITION 8
2335                    42,2556  06213 1        OCT     06213
2336                    42,2557  11036 1        2DEC    .283092873     POSITION9
2336                    42,2560  06144 0
2337                    42,2561  01031 1        2DEC    .032808399     VELOCITY4
2337                    42,2562  21032 0
A2390                                                                  END OF SFOUTAB
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A2400                                                                  NN  SF CONSTANT             SF ROUTINE

2401  REF   4  LAST  269  42,2563  03660 1  IDADDTAB ECADR  TTOGO       40 MIN/SEC                 M/S
2402  REF   1            42,2564  03653 1           ECADR  VGDISP      40 VEL3                    DP3
2403  REF   2  LAST  114  42,2565  03425 1           ECADR  DVTOTAL     40 VEL3                    DP3
2404  REF  10  LAST  269  42,2566  01045 1           ECADR  DSPTEM1     41 CDU DEG                 CDU
2405  REF  11  LAST  272  42,2567  01046 1           ECADR  DSPTEM1 +1  41 ELEV DEG                ARTH
2406                     42,2570  00000 1           OCT    0           41 SPARE COMPONENT
2407  REF   3  LAST  168  42,2571  02363 0           ECADR  HAPO        42 POS4                    DP3
2408  REF   1            42,2572  02365 0           ECADR  HPER        42 POS4                    DP3
2409  REF   2  LAST  272  42,2573  03653 1           ECADR  VGDISP      42 VEL3                    DP3
2410  REF   4  LAST  175  42,2574  01103 1           ECADR  LAT         43 DPDEG(360)              DP4
2411  REF   3  LAST  175  42,2575  01105 1           ECADR  LONG        43 DPDEG(360)              DP4
2412  REF   3  LAST  175  42,2576  01107 0           ECADR  ALT         43 POS4                    DP3
2413  REF   2  LAST   88  42,2577  02351 1           ECADR  HAPOX       44 POS4                    DP3
2414  REF   2  LAST   88  42,2600  02353 0           ECADR  HPERX       44 POS4                    DP3
2415  REF   2  LAST   88  42,2601  02343 1           ECADR  TFF         44 MIN/SEC                 M/S
2416  REF   3  LAST  175  42,2602  01125 0           ECADR  VHFCNT      45 2INT                    2INT
2417  REF   5  LAST  272  42,2603  03660 1           ECADR  TTOGO       45 MIN/SEC                 M/S
2418  REF   3  LAST  201  42,2604  03625 0           ECADR  +MGA        45 DPDEG(360)              DP4
2419  REF  13  LAST  247  42,2605  03066 1           ECADR  DAPDATR1    46 OCTAL ONLY              OCT
2420  REF   1            42,2606  03067 0           ECADR  DAPDATR2    46 OCTAL ONLY              OCT
2421                     42,2607  00000 1           OCT    0           46 SPARE COMPONENT
2422  REF   3  LAST  209  42,2610  03074 1           ECADR  CSMMASS     47 WEIGHT2                 ARTH1
2423  REF   4  LAST  172  42,2611  03073 0           ECADR  LEMMASS     47 WEIGHT2                 ARTH1
2424                     42,2612  00000 1           OCT    00000       47 SPARE COMPONENT
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2425	REF	11	LAST	254	42,2613	03025	0	ECADR	PACTOFF	48 TRIM DEG ARTH
2426	REF	1			42,2614	03026	0	ECADR	YACTOFF	48 TRIM DEG ARTH
2427					42,2615	00000	1	OCT	00000	48 SPARE COMPONENT
2428	REF	1			42,2616	03501	0	ECADR	N49DISP	49 POS4 DP3
2429	REF	2	LAST	273	42,2617	03503	1	ECADR	N49DISP +2	49 VEL3 DP3
2430	REF	3	LAST	273	42,2620	03505	1	ECADR	N49DISP +4	49 WHOLE ARTH
2431	REF	2	LAST	168	42,2621	02355	0	ECADR	RSP-RREC	50 POS6 DP3
2432	REF	3	LAST	272	42,2622	02353	0	ECADR	HPERX	50 POS4 DP3
2433	REF	3	LAST	272	42,2623	02343	1	ECADR	TFF	50 MIN/SEC M/S
2434	REF	3	LAST	243	42,2624	02320	1	ECADR	RHOSB	51 DPDEG(360)
2435	REF	1			42,2625	02322	0	ECADR	GAMMASB	51 DPDEG(360) DP4
2436					42,2626	00000	1	OCT	0	51 SPARE COMPONENT
2437	REF	2	LAST	90	42,2627	02632	1	ECADR	ACTCENT	52 DPDEG(360) DP4
2438					42,2630	00000	1	OCT	00000	52 SPARE COMPONENT
2439					42,2631	00000	1	OCT	00000	52 SPARE COMPONENT
2440	REF	6	LAST	170	42,2632	02320	1	ECADR	RANGE	53 POS5 DP1
2441	REF	2	LAST	87	42,2633	02322	0	ECADR	RRATE	53 VEL3 DP3
2442	REF	3	LAST	170	42,2634	02324	0	ECADR	RTHETA	53 DPDEG(360) DP4
2443	REF	7	LAST	273	42,2635	02320	1	ECADR	RANGE	54 POS5 DP1
2444	REF	3	LAST	273	42,2636	02322	0	ECADR	RRATE	54 VEL3 DP3
2445	REF	4	LAST	273	42,2637	02324	0	ECADR	RTHETA	54 DPDEG(360) DP4
2446	REF	1			42,2640	03645	0	ECADR	NN1	55 WHOLE ARTH
2447	REF	4	LAST	170	42,2641	03743	1	ECADR	ELEV	55 DPDEG(360) DP4
2448	REF	3	LAST	170	42,2642	03753	0	ECADR	CENTANG	55 DPDEG(360) DP4
2449	REF	2	LAST	124	42,2643	03633	1	ECADR	RTEGAM2D	56 DPDEG(360) DP4
2450	REF	2	LAST	124	42,2644	03631	0	ECADR	RTEDVD	56 VEL2 DP4
2451					42,2645	00000	1	OCT	0	56 SPARE COMPONENT
2452	REF	4	LAST	170	42,2646	02610	1	ECADR	DELTAR	57 POS4 DP3
2453					42,2647	00000	1	OCT	0	57 SPARE COMPONENT
2454					42,2650	00000	1	OCT	0	57 SPARE COMPONENT
2455	REF	1			42,2651	02640	1	ECADR	POSTTPI	58 POS4 DP3
2456	REF	3	LAST	90	42,2652	02634	1	ECADR	DELVTPI	58 VEL3 DP3
2457	REF	3	LAST	170	42,2653	02636	0	ECADR	DELVTPF	58 VEL3 DP3
2458	REF	7	LAST	91	42,2654	02610	1	ECADR	DVLOS	59 VEL3 DP3
2459	REF	8	LAST	273	42,2655	02612	0	ECADR	DVLOS +2	59 VEL3 DP3
2460	REF	9	LAST	273	42,2656	02614	0	ECADR	DVLOS +4	59 VEL3 DP3
2461	REF	2	LAST	116	42,2657	03721	0	ECADR	GMAX	60 WHOLE ARTH
2462	REF	5	LAST	173	42,2660	03766	0	ECADR	VPRED	60 VEL2 DP4
2463	REF	4	LAST	172	42,2661	03770	1	ECADR	GAMMAEI	60 DPDEG(360) DP4
2464	REF	4	LAST	172	42,2662	03400	0	ECADR	LAT(SPL)	61 DPDEG(360) DP4
2465	REF	2	LAST	114	42,2663	03402	1	ECADR	LNG(SPL)	61 DPDEG(360) DP4
2466	REF	2	LAST	109	42,2664	03326	0	ECADR	HEADSUP	61 WHOLE ARTH
2467	REF	2	LAST	116	42,2665	03722	0	ECADR	VMAGI	62 VEL2 DP4
2468	REF	1			42,2666	03736	0	ECADR	HDOT	62 VEL2 DP4
2469	REF	2	LAST	117	42,2667	03734	1	ECADR	ALTI	62 POS4 DP3
2470	REF	4	LAST	117	42,2670	03713	1	ECADR	RTGO	63 POS6 DP3
2471	REF	4	LAST	173	42,2671	03724	0	ECADR	VIO	63 VEL2 DP4
2472	REF	4	LAST	173	42,2672	03726	1	ECADR	TTE	63 MIN/SEC M/S
2473	REF	2	LAST	119	42,2673	03637	0	ECADR	D	64 DRAG ACCEL DP2
2474	REF	3	LAST	273	42,2674	03722	0	ECADR	VMAGI	64 VEL2 DP4

2475	REF	1			42,2675	03713 1	ECADR	RTGON64	64 POS6	DP3
2476	REF	2	LAST	218	42,2676	00013 C	ECADR	SAMPTIME	65 HMS (MIXED ONLY TO KEEP CODE 65)	HMS
2477	REF	3	LAST	274	42,2677	00013 C	ECADR	SAMPTIME	65 HMS	HMS
2478	REF	4	LAST	274	42,2700	00013 C	ECADR	SAMPTIME	65 HMS	HMS
2479	REF	2	LAST	109	42,2701	03315 C	ECADR	ROLLC	66 DPDEG(360)	DP4
2480	REF	1			42,2702	03675 C	ECADR	XRNGERR	66 POS8	DP3
2481	REF	2	LAST	116	42,2703	03715 1	ECADR	DNRNGERR	66 POS6	DP3
2482	REF	1			42,2704	03713 1	ECADR	RTGON67	67 POS6	DP3
2483	REF	5	LAST	272	42,2705	01103 1	ECADR	LAT	67 DPDEG(360)	DP4
2484	REF	4	LAST	272	42,2706	01105 1	ECADR	LONG	67 DPDEG(360)	DP4
2485	REF	3	LAST	274	42,2707	03315 C	ECADR	ROLLC	68 DPDEG(360)	DP4
2486	REF	4	LAST	273	42,2710	03722 C	ECADR	VMAGI	68 VEL2	DP4
2487	REF	2	LAST	116	42,2711	03677 1	ECADR	RDOT	68 VEL/2VS	DP4
2488	REF	4	LAST	274	42,2712	03315 C	ECADR	ROLLC	69 DPDEG(360)	DP4
2489	REF	1			42,2713	03174 C	ECADR	Q7	69 DRAG ACCEL	DP2
2490	REF	1			42,2714	03766 C	ECADR	VL	69 VEL/2VS	DP4
2491	REF	1			42,2715	00735 C	ECADR	STARCODE	70 OCTAL ONLY	OCT
2492	REF	10	LAST	260	42,2716	02751 C	ECADR	LANDMARK	70 OCTAL ONLY	OCT
2493	REF	2	LAST	94	42,2717	02752 C	ECADR	HORIZON	70 OCTAL ONLY	OCT
2494	REF	2	LAST	274	42,2720	00735 C	ECADR	STARCODE	71 OCTAL ONLY	OCT
2495	REF	11	LAST	274	42,2721	02751 C	ECADR	LANDMARK	71 OCTAL ONLY	OCT
2496	REF	3	LAST	274	42,2722	02752 C	ECADR	HORIZON	71 OCTAL ONLY	OCT
2497	REF	2	LAST	91	42,2723	02616 1	ECADR	THETZERO	72 DPDEG(360)	DP4
2498	REF	1			42,2724	03753 C	ECADR	DELHITE	72 POS4	DP3
2499	REF	1			42,2725	01132 C	ECADR	OPTICN2	72 WHOLE	ARTH
2500					42,2726	00000 1	OCT	0	73 SPARE	
2501					42,2727	00000 1	OCT	0	73 SPARE	
2502					42,2730	00000 1	OCT	0	73 SPARE	
2503					42,2731	00000 1	OCT	0	74 SPARE	
2504					42,2732	00000 1	OCT	0	74 SPARE	
2505					42,2733	00000 1	OCT	0	74 SPARE	
2506					42,2734	00000 1	OCT	0	75 SPARE	
2507					42,2735	00000 1	OCT	0	75 SPARE	
2508					42,2736	00000 1	OCT	0	75 SPARE	
2509					42,2737	00000 1	OCT	0	76 SPARE	
2510					42,2740	00000 1	OCT	0	76 SPARE	
2511					42,2741	00000 1	OCT	0	76 SPARE	
2512					42,2742	00000 1	OCT	0	77 SPARE	
2513					42,2743	00000 1	OCT	0	77 SPARE	
2514					42,2744	00000 1	OCT	0	77 SPARE	
2515					42,2745	00000 1	OCT	0	78 SPARE	
2516					42,2746	00000 1	OCT	0	78 SPARE	
2517					42,2747	00000 1	OCT	0	78 SPARE	
2518					42,2750	00000 1	OCT	0	79 SPARE	
2519					42,2751	00000 1	OCT	0	79 SPARE	
2520					42,2752	00000 1	OCT	0	79 SPARE	
2521	REF	6	LAST	272	42,2753	03660 1	ECADR	TTOGO	80 MIN/SEC	M/S
2522	REF	3	LAST	272	42,2754	03653 1	ECADR	VGDISP	80 VEL2	DP4
2523	REF	3	LAST	272	42,2755	03425 1	ECADR	DVTOTAL	80 VEL2	DP4
2524	REF	1			42,2756	03404 1	ECADR	DELVLVC	81 VEL3	DP3

2525	REF	2	LAST	274	42,2757	03406	C	ECADR	DELVLVC +2	81 VEL3	DP3
2526	REF	3	LAST	275	42,2760	03410	1	ECADR	DELVLVC +4	81 VEL3	DP3
2527					42,2761	00000	1	OCT	00000	82 SPARE	
2528					42,2762	00000	1	OCT	00000	82 SPARE	
2529					42,2763	00000	1	OCT	00000	82 SPARE	
2530	REF	3	LAST	207	42,2764	03674	1	ECADR	DELVIMU	83 VEL3	DP3
2531	REF	4	LAST	275	42,2765	03676	C	ECADR	DELVIMU +2	83 VEL3	DP3
2532	REF	5	LAST	275	42,2766	03700	C	ECADR	DELVIMU +4	83 VEL3	DP3
2533	REF	1			42,2767	03537	C	ECADR	DELVCV	84 VEL3	DP3
2534	REF	2	LAST	275	42,2770	03541	1	ECADR	DELVCV +2	84 VEL3	DP3
2535	REF	3	LAST	275	42,2771	03543	C	ECADR	DELVCV +4	84 VEL3	DP3
2536	REF	3	LAST	121	42,2772	03664	C	ECADR	VGBODY	85 VEL3	DP3
2537	REF	4	LAST	275	42,2773	03666	1	ECADR	VGBODY +2	85 VEL3	DP3
2538	REF	5	LAST	275	42,2774	03670	C	ECADR	VGBODY +4	85 VEL3	DP3
2539	REF	4	LAST	275	42,2775	03404	1	ECADR	DELVLVC	86 VEL2	DP4
2540	REF	5	LAST	275	42,2776	03406	C	ECADR	DELVLVC +2	86 VEL2	DP4
2541	REF	6	LAST	275	42,2777	03410	1	ECADR	DELVLVC +4	86 VEL2	DP4
2542	REF	16	LAST	251	42,3000	03730	C	ECADR	MRKBUF1 +3	87 CDU DEG	CDU
2543	REF	17	LAST	275	42,3001	03732	1	ECADR	MRKBUF1 +5	87 Y OPTICS DEG	YOPT
2544					42,3002	00000	1	OCT	0	87 SPARE COMPONENT	
2545	REF	3	LAST	208	42,3003	02765	1	ECADR	STAR	88 FRAC	FRAC
2546	REF	4	LAST	275	42,3004	02767	C	ECADR	STAR +2	88 FRAC	FRAC
2547	REF	5	LAST	275	42,3005	02771	1	ECADR	STAR +4	88 FRAC	FRAC
2548	REF	1			42,3006	01103	1	ECADR	LANDLAT	89 DPDEG(90)	DP3
2549	REF	2	LAST	88	42,3007	02357	1	ECADR	LANDLONG	89 DPDEG(90)	DP3
2550	REF	2	LAST	88	42,3010	02361	1	ECADR	LANDALT	89 POS5	DP1
2551	REF	8	LAST	273	42,3011	02320	1	ECADR	RANGE	90 POS5	DP1
2552	REF	4	LAST	273	42,3012	02322	C	ECADR	RRATE	90 VEL3	DP3
2553	REF	5	LAST	273	42,3013	02324	C	ECADR	RTHETA	90 DPDEG(360)	DP4
2554	REF	7	LAST	218	42,3014	00036	1	ECADR	CDUS	91 CDU DEG	CDU
2555	REF	6	LAST	218	42,3015	00035	1	ECADR	CDUT	91 Y OPTICS DEG	YOPT
2556					42,3016	00000	1	OCT	0	91 SPARE COMPONENT	
2557	REF	3	LAST	235	42,3017	02773	C	ECADR	SAC	92 CDU DEG	CDU
2558	REF	3	LAST	235	42,3020	02775	C	ECADR	PAC	92 Y OPTICS DEG	YOPT
2559					42,3021	00000	1	OCT	0	92 SPARE COMPONENT	
2560	REF	6	LAST	236	42,3022	02757	C	ECADR	OGC	93 DPDEG(90)	DP3
2561	REF	7	LAST	275	42,3023	02761	C	ECADR	OGC +2	93 DPDEG(90)	DP3
2562	REF	8	LAST	275	42,3024	02763	1	ECADR	OGC +4	93 DPDEG(90)	DP3
2563	REF	18	LAST	275	42,3025	03730	C	ECADR	MRKBUF1 +3	94 CDU DEG	CDU
2564	REF	19	LAST	275	42,3026	03732	1	ECADR	MRKBUF1 +5	94 Y OPTICS DEG	YOPT
2565					42,3027	00000	1	OCT	0	94 SPARE	
2566	REF	2	LAST	123	42,3030	03722	C	ECADR	PRAXIS	95 CDU DEG	CDU
2567	REF	3	LAST	275	42,3031	03723	1	ECADR	PRAXIS +1	95 CDU DEG	CDU
2568	REF	4	LAST	275	42,3032	03724	C	ECADR	PRAXIS +2	95 CDU DEG	CDU
2569	REF	4	LAST	264	42,3033	01333	C	ECADR	CPHIX	96 CDU DEG	CDU
2570	REF	5	LAST	275	42,3034	01334	1	ECADR	CPHIX +1	96 CDU DEG	CDU
2571	REF	6	LAST	275	42,3035	01335	C	ECADR	CPHIX +2	96 CDU DEG	CDU
2572	REF	12	LAST	272	42,3036	01045	1	ECADR	DSPTEM1	97 WHOLE	ARTH
2573	REF	13	LAST	275	42,3037	01046	1	ECADR	DSPTEM1 +1	97 WHOLE	ARTH
2574	REF	14	LAST	275	42,3040	01047	C	ECADR	DSPTEM1 +2	97 WHOLE	ARTH

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 2575   REF   4  LAST  264   42,3041   01050 0        ECADR  DSPTEM2      98 WHOLE                ARTH
 2576   REF   5  LAST  276   42,3042   01051 1        ECADR  DSPTEM2 +1   98 FRAC                 FRAC
 2577   REF   6  LAST  276   42,3043   01052 1        ECADR  DSPTEM2 +2   98 WHOLE                ARTH
 2578   REF   1              42,3044   02320 1        ECADR  WWPOS        99 POS9                 DP4
 2579   REF   1              42,3045   02322 0        ECADR  WWVEL        99 VEL4                 DP2
 2580   REF   1              42,3046   02324 0        ECADR  WWOPT        99 WHOLE                ARTH
R2600   END OF IOADOTAB

A2800                                                                    NN  SF ROUTINES

 2801                        42,3047   16351 1  RUTMXTAB OCT    16351    40 M/S, DP3, DP3
 2802                        42,3050   00142 0           OCT    00142    41 CDU, ARTH
 2803                        42,3051   16347 0           OCT    16347    42 DP3, DP3, DP3
 2804                        42,3052   16512 0           OCT    16512    43 DP4, DP4, DP3
 2805                        42,3053   22347 1           OCT    22347    44 DP3, DP3, M/S
 2806                        42,3054   24454 1           OCT    24454    45 2INT, M/S, DP4
 2807                        42,3055   00000 1           OCT    00000    46 OCT, OCT
 2808                        42,3056   00553 1           OCT    00553    47 ARITH1, ARITH1
 2809                        42,3057   00143 1           OCT    00143    48 ARTH, ARTH
 2810                        42,3060   06347 1           OCT    06347    49 DP3, DP3, ARTH
 2811                        42,3061   22347 1           OCT    22347    50 DP3, DP3, M/S
 2812                        42,3062   00512 1           OCT    00512    51 DP4, DP4
 2813                        42,3063   00012 1           OCT    00012    52 DP4
 2814                        42,3064   24344 1           OCT    24344    53 DP1, DP3, DP4
 2815                        42,3065   24344 1           OCT    24344    54 DP1, DP3, DP4
 2816                        42,3066   24503 1           OCT    24503    55 ARTH, DP4 , DP4
 2817                        42,3067   00512 1           OCT    00512    56 DP4, DP4
 2818                        42,3070   00007 0           OCT    00007    57 DP3
 2819                        42,3071   16347 0           OCT    16347    58 DP3, DP3, DP3
 2820                        42,3072   16347 0           OCT    16347    59 DP3, DP3, DP3
 2821                        42,3073   24503 1           OCT    24503    60 ARTH, DP4, DP4
 2822                        42,3074   06512 1           OCT    06512    61 DP4, DP4, ARTH
 2823                        42,3075   16512 0           OCT    16512    62 DP4, DP4, DP3
 2824                        42,3076   22507 0           OCT    22507    63 DP3, DP4, M/S
 2825                        42,3077   16505 0           OCT    16505    64 DP2, DP4, DP3
 2826                        42,3100   20410 0           OCT    20410    65 HMS, HMS, HMS
 2827                        42,3101   16352 1           OCT    16352    66 DP4, DP3, DP3
 2828                        42,3102   24507 0           OCT    24507    67 DP3, DP4, DP4
 2829                        42,3103   24512 1           OCT    24512    68 DP4, DP4, DP4
 2830                        42,3104   24252 1           OCT    24252    69 DP4, DP2, DP4
 2831                        42,3105   00000 1           OCT    00000    70 OCT, OCT, OCT
 2832                        42,3106   00000 1           OCT    0        71 OCT, OCT, OCT
 2833                        42,3107   06352 0           OCT    06352    72 DP4, DP3, ARTH
 2834                        42,3110   00000 1           OCT    0        73 SPARE
 2835                        42,3111   00000 1           OCT    0        74 SPARE
 2836                        42,3112   00000 1           OCT    0        75 SPARE
 2837                        42,3113   00000 1           OCT    0        76 SPARE
 2838                        42,3114   00000 1           OCT    0        77 SPARE
 2839                        42,3115   00000 1           OCT    0        78 SPARE
```

2840		42,3116	00000 1	OCT	0	79 SPARE
2841		42,3117	24511 1	OCT	24511	80 M/S, DP4, DP4
2842		42,3120	16347 0	OCT	16347	81 DP3, DP3, DP3
2843		42,3121	00000 1	OCT	00000	82 SPARE
2844		42,3122	16347 0	OCT	16347	83 DP3, DP3, DP3
2845		42,3123	16347 0	OCT	16347	84 DP3, DP3, DP3
2846		42,3124	16347 0	OCT	16347	85 DP3, DP3, DP3
2847		42,3125	24512 1	OCT	24512	86 DP4, DP4, DP4
2848		42,3126	00302 0	OCT	00302	87 CDU, YCPT
2849		42,3127	02041 0	OCT	02041	88 FRAC FOR EACH
2850		42,3130	10347 0	OCT	10347	89 DP3, DP3, DP1
2851		42,3131	24344 1	OCT	24344	90 DP1, DP3, DP4
2852		42,3132	00302 0	OCT	00302	91 CDU, YCPT
2853		42,3133	00302 0	OCT	00302	92 CDU, YCPT
2854		42,3134	16347 0	OCT	16347	93 DP3, DP3, DP3
2855		42,3135	00302 0	OCT	00302	94 CDU, YCPT
2856		42,3136	04102 0	OCT	04102	95 CDU, CDU, CDU
2857		42,3137	04102 0	OCT	04102	96 CDU, CDU, CDU
2858		42,3140	06143 1	OCT	06143	97 ARTH, ARTH, ARTH
2859		42,3141	06043 0	OCT	06043	98 ARTH, FRAC, ARTH
2860		42,3142	06252 1	OCT	06252	99 DP4, DP2, ARTH
R2870	END OF RUTMXTAB					

2871 REF 2 LAST 32 30,2000 SBANK= LOWSUPER

```
0001                        22,2000                 BANK    22
0002    REF    1            23,2000                 SETLOC  COMGEOM1
0003                        23,2000                 BANK

R0004   THIS ROUTINE TAKES THE SHAFT AND TRUNNION ANGLES AS READ BY THE CM OPTICAL SYSTEM AND CONVERTS THEM INTO A  UNIT
R0006   VECTOR REFERENCED TO THE NAVIGATION BASE COORDINATE SYSTEM AND COINCIDENT WITH THE SEXTANT LINE OF SIGHT.

R0008   THE INPUTS ARE  1) THE SEXTANT SHAFT AND TRUNNION ANGLES ARE STORED SP IN LOCATIONS 3 AND 5 RESPECTIVELY OF THE
R0010   MARK VAC AREA.  2) THE COMPLEMENT OF THE BASE ADDRESS OF THE MARK VAC AREA IS STORED SP AT LOCATION X1 OF YOUR
R0012   JOB VAC AREA.

R0013   THE OUTPUT IS A HALF-UNIT VECTOR IN NAVIGATION BASE COORDINATES AND STORED AT LOCATION 32D OF THE VAC AREA. THE
R0015   OUTPUT IS ALSO AVAILABLE AT MPAC.


0016    REF    1                                    COUNT   23/GEOM

0017                        23,2000  47133 C  SXTNB  SLOAD*  RTB         PUSHDOWN  00,02,04,(17D-19D),32D-36D
0018                        23,2001  00006 1          5,1     TRUNNION = TA
0019    REF    1            23,2002  45510 1          CDULOGIC
0020                        23,2003  41434 1          RTB     PUSH
0021    REF    1            23,2004  46027 C          SXTLOGIC
0022                        23,2005  72556 1          SIN     SL1
0023                        23,2006  66606 1          PUSH    SLOAD*      PD2 = SIN(TA)
0024                        23,2007  00004 C          3,1     SHAFT = SA
0025                        23,2010  41434 1          RTB     PUSH        PD4 = SA
0026    REF    2  LAST 278  23,2011  45510 1          CDULOGIC

0027                        23,2012  41346 C          COS     DMP
0028                        23,2013  00003 1          2
0029    REF    1            23,2014  14041 1          STODL   STARM        COS(SA)SIN(TA)

0030                        23,2015  41356 1          SIN     DMP
0031                        23,2016  77626 C          STADR
0032    REF    2  LAST 278  23,2017  63734 1          STODL   STARM +2    SIN(SA)SIN(TA)

0033                        23,2020  77746 1          COS
0034    REF    3  LAST 278  23,2021  24045 C          STCVL   STARM +4
0035    REF    4  LAST 278  23,2022  00041 1          STARM               STARM = 32D
0036                        23,2023  76521 C          MXV     VSL1
0037    REF    1            23,2024  06302 C          NBINB2
0038                        23,2025  00041 1          STORE   32D
0039                        23,2026  77616 C          RVQ


0040    REF    1            23,2027  3 2323 1 SXTLOGIC CAF    10DEGS-     CORRECT FOR 19.775 DEGREE OFFSET
0041    REF   33  LAST 256  23,2030  26 154 C         ADS     MPAC
0042    REF    1            23,2031  3 4676 1         CAF     QUARTER
0043    REF    1            23,2032  0 7256 1         TC      SHORTMP
0044    REF    1            23,2033  0 6030 1         TC      DANZIG
```

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R0045 CALCSXA COMPUTES THE SEXTANT SHAFT AND TRUNNION ANGLES REQUIRED TO POSITION THE OPTICS SUCH THAT A STAR LINE-
R0047 OF-SIGHT LIES ALONG THE STAR VECTOR. THE ROUTINE TAKES THE GIVEN STAR VECTOR AND EXPRESSES IT AS A VECTOR REF-
R0049 ERENCED TO THE OPTICS COORDINATE SYSTEM. IN ADDITION IT SETS UP THREE UNIT VECTORS DEFINING THE X,Y, AND Z AXES
R0051 REFERENCED TO THE OPTICS COORDINATE SYSTEM.

R0052 THE INPUTS ARE 1) THE STAR VECTOR REFERRED TO PRESENT STABLE MEMBER COORDINATES STORED AT STAR. 2) SAME ANGLE
R0054 INPUT AS *SMNB*, I.E. SINES AND COSINES OF THE CDU ANGLES, IN THE ORDER Y Z X, AT SINCDU AND COSCDU. A CALL
R0056 TO COLTRIG WILL PROVIDE THIS INPUT.

R0057 THE OUTPUTS ARE THE SEXTANT SHAFT AND TRUNNION ANGLES STORED DP AT SAC AND PAC RESPECTIVELY. (LOW ORDER PART
R0059 EQUAL TO ZERO).

```
0060                          23,2034  77220 1  CALCSXA  ITA     VLOAD          PUSHDOWN  00-26D,28D,30D,32D-36D
0061                          23,2035  00034 0                   28D
0062  REF   6  LAST  275      23,2036  02766 1                   STAR
0063                          23,2037  77624 1           CALL
0064  REF   1                 23,2040  47577 1                   *SMNB*
0065                          23,2041  76521 0           MXV     VSL1
0066  REF   1                 23,2042  06260 0                   NB2NB1
0067  REF   7  LAST  279      23,2043  26766 1           STOVL   STAR
0068  REF   1                 23,2044  15330 0                   HIUNITX
0069  REF   2  LAST   9C      23,2045  26555 0           STOVL   XNB1
0070  REF   1                 23,2046  15326 1                   HIUNITY
0071  REF   2  LAST   9C      23,2047  26563 0           STOVL   YNB1
0072  REF   1                 23,2050  15324 0                   HIUNITZ
0073  REF   2  LAST   9C      23,2051  36571 1           STCALL  ZNB1
0074  REF   1                 23,2052  46076 1                   SXTANG1
```

R0075 SXTANG COMPUTES THE SEXTANT SHAFT AND TRUNNION ANGLES REQUIRED TO POSITION THE OPTICS SUCH THAT A STAR LINE-OF-
R0077 SIGHT LIES ALONG THE STAR VECTOR.

R0078 THE INPUTS ARE 1) THE STAR VECTOR REFERRED TO ANY COORDINATE SYSTEM STORED AT STAR. 2) THE NAVIGATION BASE
R0080 COORDINATES REFERRED TO THE SAME COORDINATE SYSTEM. THESE THREE HALF-UNIT VECTORS ARE STORED AT XNB, YNB, AND
R0082 ZNB.

R0083 THE OUTPUTS ARE THE SEXTANT SHAFT AND TRUNNION ANGLES STORED DP AT SAC AND PAC RESPECTIVELY. (LOW ORDER PART
R0085 EQUAL TO ZERO).

```
0086                                23,2053  47020 C  SXTANG   ITA     RTB          PUSHDOWN  16D,18D,22D-26D,28D
0087                                23,2054  00034 C           28D
0088  REF   1                      23,2055  45657 1           TRANSP1      EREF WRT N82
0089                                23,2056  64375 1           VLOAD   MXV
0090  REF   1                      23,2057  02714 1           XNB
0091  REF   2  LAST  27S           23,2060  06260 C           NB2NB1
0092                                23,2061  77772 C           VSL1
0093  REF   3  LAST  27S           23,2062  26555 C           STOVL   XNB1
0094  REF   1                      23,2063  02722 1           YNB
0095                                23,2064  76521 C           MXV     VSL1
0096  REF   3  LAST  28C           23,2065  06260 C           NB2NB1
0097  REF   3  LAST  27S           23,2066  26563 C           STOVL   YNB1
0098  REF   1                      23,2067  02730 1           ZNB

0099                                23,2070  76521 C           MXV     VSL1
0100  REF   4  LAST  28C           23,2071  06260 C           NB2NB1
0101  REF   3  LAST  27S           23,2072  02571 C           STORE   ZNB1

0102                                23,2073  47034 C           RTB     RTB
0103  REF   2  LAST  28C           23,2074  45657 1           TRANSP1
0104  REF   1                      23,2075  45673 1           TRANSP2

0105                                23,2076  47375 0  SXTANG1  VLOAD   VXV
0106  REF   4  LAST  28C           23,2077  02571 C           ZNB1
0107  REF   8  LAST  27S           23,2100  02766 1           STAR
0108                                23,2101  77600 1           BOV
0109                                23,2102  46103 1           +1
0110                                23,2103  40056 C           UNIT    BOV
0111  REF   1                      23,2104  46145 C           ZNB=S1
0112  REF   1                      23,2105  00027 1           STORE   PDA          PDA = UNIT(ZNB X S)

0113                                23,2106  57441 1           DOT     DCOMP
0114  REF   4  LAST  28C           23,2107  02555 0           XNB1
0115  REF   1                      23,2110  24023 C           STOVL   SINTH        SIN(SA) = PDA . -XNB
0116  REF   2  LAST  28C           23,2111  00027 1           PDA

0117                                23,2112  77641 1           DOT
0118  REF   4  LAST  28C           23,2113  02563 C           YNB1
0119  REF   1                      23,2114  34021 C           STCALL  COSTH        COS(SA) = PDA . YNB
0120  REF   1                      23,2115  47211 C           ARCTRIG
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```
0121                          23,2116  77634 0          RTB
0122  REF   1                 23,2117  45543 1                   1STO2S
0123  REF   4  LAST  275      23,2120  26774 1          STOVL    SAC
0124  REF   9  LAST  280      23,2121  02766 1                   STAR
0125                          23,2122  77600 1          BOV
0126                          23,2123  46124 1                   +1
0127                          23,2124  72441 0          DOT      SL1
0128  REF   5  LAST  280      23,2125  02571 0                   ZNB1
0129                          23,2126  77726 1          ACOS
0131                          23,2127  62440 0          BMN      SL2
0132  REF   1                 23,2130  46142 1                   SXTALARM      TRUNNION ANGLE NEGATIVE
0133                          23,2131  45200 1          BOV      DSU
0134  REF   2  LAST  281      23,2132  46142 1                   SXTALARM      TRUNNION ANGLE GREATER THAN 90 DEGREES
0135  REF   1                 23,2133  06331 0                   20DEG-
0136                          23,2134  77634 0          RTB
0137  REF   2  LAST  281      23,2135  45543 1                   1STO2S
0138  REF   4  LAST  275      23,2136  02776 0          STORE    PAC           FOR FLIGHT USE, CULTFLAG IS ON IF
0139                          23,2137  77614 1          CLRGO                  TRUNION IS GREATER THAN 90 DEG
0140  REF   1                 23,2140  01630 0                   CULTFLAG
0141                          23,2141  00034 0                   28D
0142                          23,2142  77614 1  SXTALARM SETGO                 ALARM HAS BEEN REMOVED FROM THIS
0143  REF   2  LAST  281      23,2143  01430 1                   CULTFLAG
0144                          23,2144  00034 0                   28D           SUBROUTINE,ALARM WILL BE SET BY MPI
0145                          23,2145  77745 1  ZNB=S1   DLOAD
0146  REF   1                 23,2146  06325 0                   270DEG
0147  REF   5  LAST  281      23,2147  16774 1          STODL    SAC
0148  REF   1                 23,2150  06327 1                   20DEGS-
0149  REF   5  LAST  281      23,2151  02776 0          STORE    PAC
0150                          23,2152  77614 1          CLRGO
0151  REF   3  LAST  281      23,2153  01630 0                   CULTFLAG
0152                          23,2154  00034 0                   28D
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P0153   THESE TWO ROUTINES COMPUTE THE ACTUAL STATE VECTOR FOR LM, CSM BY ADDING
R0154   THE CONIC R,V AND THE DEVIATIONSR,V. THE STATE VECTORS ARE CONVERTED TO
R0155   METERS B-29 AND METERS/CSEC B-7 AND STORED APPROPRIATELY IN RN,VN OR
R0156   R-OTHER , V-OTHER FOR DOWNLINK. THE ROUTINES NAMES ARE SWITCHED IN THE
R0157   OTHER VEHICLES COMPUTER.

R0158   INPUT
R0159     STATE VECTOR IN TEMPORARY STORAGE AREA
R0160     IF STATE VECTOR IS SCALED POS B27 AND VEL B5
R0161        SET X2 TO +2
R0162     IF STATE VECTOR IS SCALED POS B29 AND VEL B7
R0163        SET X2 TO 0

R0164   OUTPUT
R0165     R(T) IN RN, V(T) IN VN, T IN PIPTIME
R0166   OR
R0167     R(T) IN R-OTHER, V(T) IN V-OTHER    (T IS DEFINED BY T-OTHER)


 0168                          23,2155                          BANK    23
 0169   REF    1               10,2000                          SETLOC  COMGEOM2
 0170                          10,2237                          BANK
 0171   REF    1                                                COUNT   10/GEOM
 0172                          10,2237   43414 1  SVDWN1        BOF     RVQ             SW=1=AVETOMID DOING W-MATRIX INTEG
01721   REF    1               10,2240   04756 1                                        AVEMIDSW
01722                          10,2241   20242 1                                        +1
01723                          10,2242   53775 1                VLOAD   VSL*
 0173   REF    2  LAST   82    10,2243   01521 0                                        TDELTAV
 0174                          10,2244   57605 0                                        0 -7,2
 0175                          10,2245   53655 1                VAD     VSL*
 0176   REF    2  LAST   82    10,2246   01535 0                                        RCV
 0177                          10,2247   57576 1                                        0,2
 0178   REF    4  LAST  167    10,2250   25171 1                STOVL   RN
 0179   REF    2  LAST   82    10,2251   01527 0                                        TNUV
 0180                          10,2252   53257 1                VSL*    VAD
 0181                          10,2253   57602 1                                        0 -4,2
 0182   REF    2  LAST   82    10,2254   01543 1                                        VCV
 0183                          10,2255   77657 0                VSL*
 0184                          10,2256   57576 1                                        0,2
 0185   REF    4  LAST  167    10,2257   15177 1                STODL   VN
 0186   REF    3  LAST  265    10,2260   01517 0                                        TET
 0187   REF    3  LAST  167    10,2261   01205 1                STORE   PIPTIME
 0188                          10,2262   77616 0                RVQ


 0189                          10,2263   53775 1  SVDWN2        VLOAD   VSL*
 0190   REF    3  LAST  282    10,2264   01521 0                                        TDELTAV
 0191                          10,2265   57605 0                                        0 -7,2
 0192                          10,2266   53655 1                VAD     VSL*
 0193   REF    3  LAST  282    10,2267   01535 0                                        RCV
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0194                                10,2270   57576 1                 0,2
0195   REF   4  LAST  167           10,2271   25722 1          STOVL  R-OTHER
0196   REF   3  LAST  282           10,2272   01527 0                 TNUV
0197                                10,2273   53257 1          VSL*   VAD
0198                                10,2274   57602 1                 0 -4,2
0199   REF   3  LAST  282           10,2275   01543 1                 VCV
0200                                10,2276   77657 0          VSL*
0201                                10,2277   57576 1                 0,2
0202   REF   4  LAST  167           10,2300   01730 1          STORE  V-OTHER
0203                                10,2301   77616 0          RVQ
```

```
R0204   SUBROUTINE TO COMPUTE THE NATURAL LOG OF C(MPAC, MPAC +1).

R0205           ENTRY:      CALL
R0206                           LOG

R0207   SUBROUTINE RETURNS WITH  -LOG  IN DP MPAC.

R0208   EBANK IS ARBITRARY..


 0209                       14,2000                  BANK    14
 0210   REF   1             23,2000                  SETLOC  POWFLIT2
 0211                       23,2155                  BANK
 0212   REF   2 LAST  278 TO  282:   109   109*      COUNT   23/GEOM

 0213                       23,2155   44301 0  LOG   NORM    BDSU        GENERATES LOG BY SHIFTING ARG
 0214   REF  34  LAST  278  23,2156   00160 0        MPAC +3             UNTIL IT LIES BETWEEN .5 AND 1.
 0215   REF   1             23,2157   06212 0        NEARLY1             THE LOG OF THIS PART IS FOUND AND THE
 0216                       23,2160   77776 1        EXIT                LOG OF THE SHIFTED PART IS COMPUTED

 0217   REF   1             23,2161  0 7171 1        TC      POLY        AND ADDED IN. SHIFT COUNT STORED

 0218                       23,2162   00002 0        DEC     2           (N-1, SUPPLIED BY SMERZH)
 0219                       23,2163   00000 1        2DEC    0           IN MPAC +3.
 0219                       23,2164   00000 1
 0220                       23,2165   01001 1        2DEC    .031335467
 0220                       23,2166   14636 1
 0221                       23,2167   00325 0        2DEC    .0130145859
 0221                       23,2170   07310 1
 0222                       23,2171   00541 1        2DEC    .0215738898
 0222                       23,2172   16735 1

 0223   REF  24  LAST  260  23,2173   3 4714 1       CAF     ZERO
 0224   REF  35  LAST  284  23,2174   54 156 1       TS      MPAC +2
 0225                       23,2175   0 0006 1       EXTEND
 0226   REF   1             23,2176   3 2214 1       DCA     CLOG2/32
 0227   REF  36  LAST  284  23,2177   52 155 1       DXCH    MPAC
 0228   REF  37  LAST  284  23,2200   52 160 1       DXCH    MPAC +3
 0229                       23,2201   4 0000 0       COM                 LOAD POSITIVE SHIFT COUNT IN A.
 0230   REF   2  LAST  278  23,2202   0 7256 1       TC      SHORTMP     MULTIPLY BY SHIFT COUNT.

 0231   REF  38  LAST  284  23,2203   52 156 1       DXCH    MPAC +1
 0232   REF  39  LAST  284  23,2204   52 155 1       DXCH    MPAC
 0233   REF  40  LAST  284  23,2205   52 160 1       DXCH    MPAC +3
 0234   REF  41  LAST  284  23,2206   20 155 1       DAS     MPAC
 0235   REF   8  LAST  258  23,2207   0 6006 1       TC      INTPRET     RESULT IN MPAC, MPAC +1

 0236                       23,2210    77616 0       RVQ

 0237                       23,2211    37777 1  NEARLY1  2DEC    .999999999
 0237                       23,2212    37777 1
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0238                    23,2213   00542 1  CLOG2/32 2DEC    .0216608494
0238                    23,2214   34414 1
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P0239   SUBROUTINE NAME:        EARTH ROTATOR     (EARROT1 OR EARROT2)          DATE:            15 FEB 67
R0241   MOD NO:  N +1                                                          LOG SECTION:     POWERED FLIGHT SUBROS
R0243   MOD BY:  ENTRY GROUP  (BAIRNSFATHER)
R0244   FUNCTIONAL DESCRIPTION:      THIS ROUTINE PROJECTS THE INITIAL EARTH TARGET VECTOR   RTINIT   AHEAD THROUGH
R0246           THE ESTIMATED TIME OF FLIGHT. INITIAL CALL RESOLVES THE INITIAL TARGET VECTOR   RTINIT   INTO EASTERLY
R0248           AND NORMAL COMPONENTS   RTEAST   AND   RTNORM   . INITIAL AND  SUBSEQUENT CALLS ROTATE THIS VECTOR
R0250           ABOUT THE (FULL) UNIT POLAR AXIS   UNITW   THROUGH THE ANGLE    WIE DTEAROT   TO OBTAIN THE ROTATED
R0252           TARGET VECTOR   RT   . ALL VECTORS EXCEPT   UNITW   ARE HALF UNIT.
R0254           THE EQUATIONS ARE
R0255                   -    -          -                    -
R0256                   RT = RTINIT + RTNORM (COS(WT) -1) + RTEAST SIN(WT)
R0257           WHERE   WT = WIE DTEAROT
R0258                   RTINIT = INITIAL TARGET VECTOR
R0259                   -      -   -
R0260                   RTEAST = UNITW*RTINIT
R0261                   -      -   -
R0262                   RTNORM = RTEAST*UNITW

R0263           FOR CONTINUOUS UPDATING, ONLY ONE ENTRY TO EARROT1 IS REQUIRED, WITH SUBSEQUENT ENTRIES AT EARROT2.
R0265   CALLING SEQUENCE:  FIRST CALL                    SUBSEQUENT CALL
R0266                     STCALL DTEAROT                 STCALL DTEAROT
R0267                            EARROT1                        EARROT2
R0268                     C(MPAC) UNSPECIFIED            C(MPAC) = DTEAROT
R0269           PUSHLOC = PDL+0, ARBITRARY.  6 LOCATIONS USED.

R0270   SUBROUTINES USED:  NONE
R0271   NORMAL EXIT MODES:   RVQ
R0272   ALARMS:  NONE
R0273   OUTPUT:  RTEAST (-1)          .5 UNIT VECTOR EAST, COMPNT OF RTINIT   LEFT BY FIRST CALL
R0275            RTNORM (-1)          .5 UNIT VECTOR NORML, COMPNT OF RTINIT  LEFT BY FIRST CALL
R0277            RT     (-1)          .5 UNIT TARGET VECTOR, ROTATED          LEFT BY ALL CALLS
R0279            DTEAROT  (-28) CS    MAY BE CHANGED BY EARROT2, IF OVER 1 DAY
R0280   ERASABLE INITIALIZATION REQUIRED:
R0281            UNITW  (0)           UNIT POLAR VECTOR                       PAD LOADED
R0283            RTINIT (-1)          .5 UNIT INITIAL TARGET VECTOR           LEFT BY ENTRY
R0285            DTEAROT  (-28) CS    TIME OF FLIGHT                          LEFT BY CALLER
R0287   DEBRIS:  QPRET,     PDL+0 ... PDL+5
```

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P0288

 0289   REF   3  LAST  209   E7,1451                          EBANK= RTINIT

 0290                        23,2215   47375 C  EARROT1  VLOAD  VXV
 0291   REF   3  LAST   83   23,2216   01714 1            UNITW    FULL UNIT VECTOR
 0292   REF   4  LAST  287   23,2217   03452 1            RTINIT   .5 UNIT
 0293   REF   2  LAST  115   23,2220   03460 C            STORE    RTEAST   .5 UNIT

 0294                        23,2221   77635 1            VXV
 0295   REF   4  LAST  287   23,2222   01714 1            UNITW    FULL UNIT
 0296   REF   2  LAST  115   23,2223   17466 C            STODL    RTNORM   .5 UNIT
 0297   REF   2  LAST  115   23,2224   03606 1            DTEAROT  (-28) CS

 0298                        23,2225   56204 1  EARROT2  BOVB   DDV
 0299   REF   1              23,2226   57314 C            TCDANZIG RESET OVFIND, IF ON
 0300   REF   1              23,2227   06256 C            1/WIE
 0301                        23,2230   41400 C            BOV      PUSH
 0302   REF   1              23,2231   46245 C            OVERADAY
 0303                        23,2232   45346 1            COS      DSU
 0304   REF   1              23,2233   15330 C            HIDPHALF
 0305                        23,2234   65361 C            VXSC     PDDL     XCH W PUSH LIST
 0306   REF   3  LAST  287   23,2235   03466 C            RTNORM   .5 UNIT
 0307                        23,2236   74356 1            SIN      VXSC
 0308   REF   3  LAST  287   23,2237   03460 C            RTEAST   .5 UNIT
 0309                        23,2240   76455 1            VAD      VSL1
 0310                        23,2241   53455 C            VAD      UNIT     INSURE THAT RT IS 'UNIT'.
 0311   REF   5  LAST  287   23,2242   03452 1            RTINIT   .5 UNIT
 0312   REF   2  LAST  115   23,2243   03474 C            STORE    RT       .5 UNIT TARGET VECTOR

 0313                        23,2244   77616 C            RVQ

 0314                        23,2245   75345 1  OVERADAY DLOAD  SIGN
 0315   REF   2  LAST  287   23,2246   06256 C                     1/WIE
 0316   REF   3  LAST  287   23,2247   03606 1                     DTEAROT
 0317                        23,2250   77621 1            BDSU
 0318   REF   4  LAST  287   23,2251   03606 1                     DTEAROT
 0319   REF   5  LAST  287   23,2252   03606 1            STORE    DTEAROT

 0320                        23,2253   77650 1            GOTO
 0321   REF   1              23,2254   46225 C                     EARROT2

A0322                                          WIE      2DEC     .1901487997
 0323                        23,2255   01015 1  1/WIE    2DEC     8616410
 0323                        23,2256   34732 C
 1036                        23,2257   15373 1  NB2NB1   2DEC     +.8431756920 B-1
 1036                        23,2260   11346 C
 1037                        23,2261   00000 1            2DEC     0
 1037                        23,2262   00000 1
 1038                        23,2263   67313 1            2DEC     -.5376381241 B-1
 1038                        23,2264   65307 C
```

```
1039                23,2265   00000 1  ZERINFLT 2DEC   0
1039                23,2266   00000 1
1040                23,2267   20000 0  HALFNFLT 2DEC   .5
1040                23,2270   00000 1
1041                23,2271   00000 1           2DEC   0
1041                23,2272   00000 1

1042                23,2273   10464 0           2DEC   +.5376381241 B-1
1042                23,2274   12470 1
1043                23,2275   00000 1           2DEC   0
1043                23,2276   00000 1
1044                23,2277   15373 1           2DEC   +.8431756920 B-1
1044                23,2300   11346 0


1045                23,2301   15373 1  NB1NB2   2DEC   +.8431756920 B-1
1045                23,2302   11346 0
1046                23,2303   00000 1           2DEC   0
1046                23,2304   00000 1
1047                23,2305   10464 0           2DEC   +.5376381241 B-1
1047                23,2306   12470 1
1048                23,2307   00000 1           2DEC   0
1048                23,2310   00000 1
1049                23,2311   20000 0           2DEC   .5
1049                23,2312   00000 1
1050                23,2313   00000 1           2DEC   0
1050                23,2314   00000 1

1051                23,2315   67313 1           2DEC   -.5376381241 B-1
1051                23,2316   65307 0
1052                23,2317   00000 1           2DEC   0
1052                23,2320   00000 1
1053                23,2321   15373 1           2DEC   +.8431756920 B-1
1053                23,2322   11346 0
```

L CSM GEOMETRY USER'S PAGE NO. 12 E7 S3

```
1054                    23,2323   07020 1  10DEGS-  DEC    3600

1055                    23,2324   60000 1  270DEG   OCT    60000        SHAFT   270 DEGREES   2S COMP.
1056                    23,2325   00000 1           OCT    00000

1057                    23,2326   61740 0  20DEGS-  DEC    -07199
1058                    23,2327   77777 0           DEC    -00000

1059                    23,2330   07020 1  20DEG-   DEC    03600
1060                    23,2331   00000 1           DEC    00000
```

L IMU COMPENSATION PACKAGE USER'S PAGE NO. 1 EO S3

```
0001                              07,2440                    BANK   7
00101 REF    1                    06,2000                    SETLOC IMUCOMP
00102                             06,3262                    BANK
0002  REF    2  LAST   81         E3,1460                    EBANK= NBDX

0100  REF    1                                               COUNT  06/ICOMP

0112  REF    1                    06,3262  3 3516 C  1/PIPA  CAF    LGCOMP      SAVE EBANK OF CALLING PROGRAM
0113  REF   14  LAST  26C         06,3263  56 003 1          XCH    EBANK
0114  REF    1                    06,3264  54 163 1          TS     MODE

0115  REF    1                    06,3265  11'477 C          CCS    GCOMPSW     BYPASS IF GCOMPSW NEGATIVE
0116                              06,3266  1 3271 1          TCF    +3
0117                              06,3267  1 3271 1          TCF    +2
0118  REF    1                    06,3270  1 3407 C          TCF    IRIG1       RETURN

01181                             06,3271  0 0004 C          INHINT               ASSURE COMPLETE COMPENSATION OF DELV'S
A01182                                                                           FOR DOWNLINK.
0119  REF    1                    06,3272  3 4710 C  1/PIPA1 CAF    FOUR        PIPAZ, PIPAY, PIPAX
0120  REF    4  LAST   67         06,3273  54 132 C          TS     BUF +2

0121  REF    5  LAST  29C         06,3274  50 132 1          INDEX  BUF +2
0122  REF    1                    06,3275  3 1453 1          CA     PIPASCF     (P.P.M.) X 2(-9)
0123                              06,3276  0 0006 1          EXTEND
0124  REF    6  LAST  29C         06,3277  5 0132 1          INDEX  BUF +2
0125  REF    1                    06,3300  7 1162 1          MP     DELVX       (PP) X 2(+14) NOW (PIPA PULSES) X 2(+5)
0126  REF   32  LAST  263         06,3301  54 002 1          TS     Q           SAVE MAJOR PART

0127  REF   20  LAST  239         06,3302  3 0001 C          CA     L           MINOR PART
0128                              06,3303  0 0006 1          EXTEND
0129  REF   25  LAST  218         06,3304  7 4705 C          MP     BIT6        SCALE 2(+9)   SHIFT RIGHT 9
0130  REF    7  LAST  29C         06,3305  50 132 1          INDEX  BUF +2
0131  REF    2  LAST  29C         06,3306  55'163 C          TS     DELVX +1    FRACTIONAL PIPA PULSES SCALED 2(+14)

0132  REF   33  LAST  29C         06,3307  3 0002 C          CA     Q           MAJOR PART
0133                              06,3310  0 0006 1          EXTEND
0134  REF   26  LAST  29C         06,3311  7 4705 C          MP     BIT6        SCALE 2(+9)   SHIFT RIGHT 9
0135  REF    8  LAST  29C         06,3312  50 132 1          INDEX  BUF +2
0136  REF    3  LAST  29C         06,3313  21'163 C          DAS    DELVX       (PIPAI) + (PIPAI)(SFE)

0137  REF    9  LAST  29C         06,3314  50 132 1          INDEX  BUF +2
0138  REF    1                    06,3315  4 1452 1          CS     PIPABIAS    (PIPA PULSES)/(CS) X 2(-8)              *
0139                              06,3316  0 0006 1          EXTEND
0140  REF    2  LAST   74         06,3317  7 1074 1          MP     1/PIPADT    (CS) X 2(+8)  NOW (PIPA PULSES) X 2(+0)*
0141                              06,3320  0 0006 1          EXTEND
0142  REF   28  LAST  255         06,3321  7 4712 C          MP     BIT1        SCALE 2(+14)  SHIFT RIGHT 14            *
0143  REF   10  LAST  29C         06,3322  50 132 1          INDEX  BUF +2
0144  REF    4  LAST  29C         06,3323  21'163 C          DAS    DELVX       (PIPAI) + (PIPAI)(SFE) - (BIAS)(DELTAT)

0145  REF   11  LAST  29C         06,3324  10 132 C          CCS    BUF +2      PIPAZ, PIPAY, PIPAX
```

L IMU COMPENSATION PACKAGE USER'S PAGE NO. 2 E3 S3

```
0146   REF   1          06,3325  6 7716 C        AD      NEG1
0147   REF   1          06,3326  1 3273 C        TCF     1/PIPA1 +1
0148                    06,3327  13 330 0        NOOP                    LESS THAN ZERO IMPOSSIBLE.
01481                   06,3330  0 0003 1        RELINT
```

L IMU COMPENSATION PACKAGE USER'S PAGE NO. 3 E3 S3

```
PC1482
 0149   REF   2  LAST  29C   06,3331  55'477 C  IRIGCOMP TS      GCOMPSW          INDICATE COMMANDS 2 PULSES OR LESS
 0150   REF  12  LAST  29C   06,3332  54 130 1            TS      BUF              INDEX COUNTER - IRIGX, IRIGY, IRIGZ

 0151                        06,3333  0 0006 1  IRIGX     EXTEND
 0152   REF   5  LAST  29C   06,3334  4 1163 C            DCS     DELVX            (PIPA PULSES) X 2(+14)
 0153   REF  42  LAST  284   06,3335  52 155 1            DXCH    MPAC
 0154   REF   1              06,3336  3 1463 1            CA      ADIAX            (GYRO PULSES)/(PIPA PULSE) X 2(-3)     *
 0155   REF   1              06,3337  0 3412 C            TC      GCOMPSUB         -(ADIAX)(PIPAX)   (GYRO PULSES) X 2(+14)

 0156                        06,3340  0 0006 1            EXTEND
 0157   REF   1              06,3341  4 1165 C            DCS     DELVY            (PIPA PULSES) X 2(+14)
 0158   REF  43  LAST  292   06,3342  52 155 1            DXCH    MPAC
 0159   REF   1              06,3343  4 1466 C            CS      ADSRAX           (GYRO PULSES)/(PIPA PULSE) X 2(-3)     *
 0160   REF   2  LAST  292   06,3344  0 3412 C            TC      GCOMPSUB         +(ADSRAX)(PIPAY)  (GYRO PULSES) X 2(+14)

A01603                                                   EXTEND          ***
A01604                                                   DCS     DELVZ   ***      (PIPA PULSES) X 2(+14)
A01605                                                   DXCH    MPAC    ***
A01606                                                   CA      ADOAX   ***      (GYRO PULSES)/(PIPA PULSE) X 2(-3)     *
A01607                                                   TC      GCOMPSUB ***     -(ADOAX)(PIPAZ)   (GYRO PULSES) X 2(+14)

 0161   REF   3  LAST  29C   06,3345  4 1460 C            CS      NBDX             (GYRO PULSES)/(CS) X 2(-5)
 0162   REF   1              06,3346  0 3441 C            TC      DRIFTSUB         -(NBDX)(DELTAT)   (GYRO PULSES) X 2(+14)

 0163                        06,3347  0 0006 1  IRIGY     EXTEND
 0164   REF   2  LAST  292   06,3350  4 1165 C            DCS     DELVY            (PIPA PULSES) X 2(+14)
 0165   REF  44  LAST  292   06,3351  52 155 1            DXCH    MPAC
 0166   REF   1              06,3352  3 1464 C            CA      ADIAY            (GYRO PULSES)/(PIPA PULSE) X 2(-3)     *
 0167   REF   3  LAST  292   06,3353  0 3412 C            TC      GCOMPSUB         -(ADIAY)(PIPAY)   (GYRO PULSES) X 2(+14)

 0168                        06,3354  0 0006 1            EXTEND
 0169   REF   1              06,3355  4 1167 1            DCS     DELVZ            (PIPA PULSES) X 2(+14)
 0170   REF  45  LAST  292   06,3356  52 155 1            DXCH    MPAC
 0171   REF   1              06,3357  4 1467 1            CS      ADSRAY           (GYRO PULSES)/(PIPA PULSE) X 2(-3)     *
 0172   REF   4  LAST  292   06,3360  0 3412 C            TC      GCOMPSUB         +(ADSRAY)(PIPAZ)  (GYRO PULSES) X 2(+14)

A01723                                                   EXTEND          ***
A01724                                                   DCS     DELVX   ***      (PIPA PULSES) X 2(+14)
A01725                                                   DXCH    MPAC    ***
A01726                                                   CA      ADOAY   ***      (GYRO PULSES)/(PIPA PULSE) X 2(-3)     *
A01727                                                   TC      GCOMPSUB ***     -(ADOAY)(PIPAX)   (GYRO PULSES) X 2(+14)

 0173   REF   1              06,3361  4 1461 1            CS      NBDY             (GYRO PULSES)/(CS) X 2(-5)
 0174   REF   2  LAST  292   06,3362  0 3441 C            TC      DRIFTSUB         -(NBDY)(DELTAT)   (GYRO PULSES) X 2(+14)

 0175                        06,3363  0 0006 1  IRIGZ     EXTEND
 0176   REF   3  LAST  292   06,3364  4 1165 C            DCS     DELVY            (PIPA PULSES) X 2(+14)
 0177   REF  46  LAST  292   06,3365  52 155 1            DXCH    MPAC
 0178   REF   1              06,3366  3 1470 C            CA      ADSRAZ           (GYRO PULSES)/(PIPA PULSE) X 2(-3)     *
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L INL COMPENSATION PACKAGE USER'S PAGE NO. 4 E3 S3

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 0179   REF   5  LAST  292   06,3367  0 3412 C    TC     GCOMPSUB       -(ADSRAZ)(PIPAY)  (GYRO PULSES) X 2(+14)

 0180                        06,3370  C 0006 1    EXTEND
 0181   REF   2  LAST  292   06,3371  4 1167 1    DCS    DELV2          (PIPA PULSES) X 2(+14)
 0182   REF  47  LAST  292   06,3372  52 155 1    DXCH   MPAC
 0183   REF   1              06,3373  3 1465 1    CA     ADIAZ          (GYRO PULSES)/(PIPA PULSE) X 2(-3)     *
 0184   REF   6  LAST  293   06,3374  0 3412 C    TC     GCOMPSUB       -(ADIAZ)(PIPAZ)   (GYRO PULSES) X 2(+14)

A01843                                           EXTEND        ***
A01844                                           DCS    DELVX  ***     (PIPA PULSE) X 2(+14)
A01845                                           DXCH   MPAC   ***
A01846                                           CS     ADOAZ  ***     (GYRO PULSES)/(PIPA PULSE) X 2(-3)     *
A01847                                           TC     GCOMPSUB ***   +(ADOAZ)(PIPAX)   (GYRO PULSES) X 2(+14)

 0185   REF   1              06,3375  3 1462 C    CA     NBDZ           (GYRO PULSES)/(CS) X 2(-5)
 0186   REF   3  LAST  292   06,3376  0 3441 C    TC     DRIFTSUB       +(NBDZ)(DELTAT)   (GYRO PULSES) X 2(+14)
```

L IMU COMPENSATION PACKAGE USER'S PAGE NO. 5 E3 S3

```
0187  REF   3  LAST  292   06,3377  11'477 C          CCS     GCOMPSW     ARE GYRO COMMANDS GREATER THAN 2 PULSES
0188                       06,3400  1 3402 0          TCF     +2          YES
0189  REF   2  LAST  29C   06,3401  1 3407 C          TCF     IRIG1       NO

0191  REF   1              06,3402  3 4764 C          CAF     PRIO17       LEM PRIORITY HIGHER-THIS FOR PRELAUNCH
0192  REF  1C  LAST  25C   06,3403  0 5027 1          TC      NOVAC
0193  REF   4  LAST  292   E3,1460                    EBANK=  NBDX
0194  REF   1              06,3404   03474 C         2CADR   1/GYRO
0194  REF   1              06,3405   14063 1

0195                       06,3406  0 0003 1          RELINT
0196  REF   2  LAST  29C   06,3407  3 0163 C  IRIG1   CA      MODE        SET EBANK FOR RETURN
0197  REF  15  LAST  29C   06,3410  54 003 0          TS      EBANK
0198  REF   9  LAST  217   06,3411  1 4570 C          TCF     SWRETURN


0199  REF  48  LAST  293   06,3412  56 154 1  GCOMPSUB XCH     MPAC        ADIA OR ADSRA COEFFICIENT ARRIVES IN A
0200                       06,3413  0 0006 1          EXTEND                C(MPAC) = (PIPA PULSES) X 2(+14)
0201  REF  49  LAST  294   06,3414  7 0154 C          MP      MPAC        (GYRO PULSES)/(PIPA PULSE) X 2(-3)     *
0202  REF  14  LAST   66   06,3415  52 123 0          DXCH    VBUF        NCW = (GYRO PULSES) X 2(+11)           *

0203  REF  5C  LAST  294   06,3416  3 0155 C          CA      MPAC +1     MINOR PART PIPA PULSES
0204                       06,3417  0 0006 1          EXTEND
0205  REF  51  LAST  294   06,3420  7 0154 C          MP      MPAC        ADIA OR ADSRA
0206  REF  21  LAST  29C   06,3421  54 001 1          TS      L
0207  REF  25  LAST  284   06,3422  3 4714 1          CAF     ZERO
0208  REF  15  LAST  294   06,3423  20 123 C          DAS     VBUF        NCW = (GYRO PULSES) X 2(+11)           *

0209  REF  16  LAST  294   06,3424  3 0122 0          CA      VBUF        PARTIAL RESULT - MAJOR
0210                       06,3425  0 0006 1          EXTEND
0211  REF  15  LAST  226   06,3426  7 4677 1          MP      BIT12       SCALE 2(+3)      SHIFT RIGHT 3         *
0212  REF  13  LAST  292   06,3427  5C 130 C          INDEX   BUF         RESULT = (GYRO PULSES) X 2(+14)
0213  REF   3  LAST   82   06,3430  21'472 C          DAS     GCOMP       HI(ADIA)(PIPAI)  OR  HI(ADSRA)(PIPAI)

0214  REF  17  LAST  294   06,3431  3 0123 1          CA      VBUF +1     PARTIAL RESULT - MINOR
0215                       06,3432  0 0006 1          EXTEND
0216  REF  16  LAST  294   06,3433  7 4677 1          MP      BIT12       SCALE 2(+3)      SHIFT RIGHT 3         *
0217  REF  22  LAST  294   06,3434  54 001 1          TS      L
0218  REF  26  LAST  294   06,3435  3 4714 1          CAF     ZERO
0219  REF  14  LAST  294   06,3436  5C 130 C          INDEX   BUF         RESULT = (GYRO PULSES) X 2(+14)
0220  REF   4  LAST  294   06,3437  21'472 C          DAS     GCOMP       (ADIA)(PIPAI)  OR  (ADSRA)(PIPAI)

0221  REF  34  LAST  29C   06,3440  0 0002 C          TC      Q
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0222                          06,3441  0 0006 1  DRIFTSUB EXTEND
0223  REF  15  LAST  294     06,3442  22 131 1            QXCH    BUF +1

0224                          06,3443  0 0006 1            EXTEND              C(A) = NBD    (GYRO PULSES)/(CS) X 2(-5)
0225  REF   3  LAST  290     06,3444  7 1074 1            MP      1/PIPADT    (CS) X 2(+8)   NOW (GYRO PULSES) X 2(+3)
0226  REF  52  LAST  294     06,3445  22 155 C            LXCH    MPAC +1     SAVE FOR FRACTIONAL COMPENSATION
0227                          06,3446  0 0006 1            EXTEND
0228  REF  20  LAST  249     06,3447  7 4707 1            MP      BIT4        SCALE 2(+11)     SHIFT RIGHT 11
0229  REF  16  LAST  295     06,3450  50 130 C            INDEX   BUF
0230  REF   5  LAST  294     06,3451  21'472 C            DAS     GCOMP       HI(NBD)(DELTAT)   (GYRO PULSES) X 2(+14)

0231  REF  53  LAST  295     06,3452  3 0155 C            CA      MPAC +1     NOW MINOR PART
0232                          06,3453  0 0006 1            EXTEND
0233  REF  21  LAST  295     06,3454  7 4707 1            MP      BIT4        SCALE 2(+11)     SHIFT RIGHT 11
0234  REF  23  LAST  294     06,3455  54 001 1            TS      L
0235  REF  27  LAST  294     06,3456  3 4714 1            CAF     ZERO
0236  REF  17  LAST  295     06,3457  50 130 C            INDEX   BUF         ADD IN FRACTIONAL COMPENSATION
0237  REF   6  LAST  295     06,3460  21'472 C            DAS     GCOMP       (NBD)(DELTAT)     (GYRO PULSES) X 2(+14)

0238  REF   6  LAST  263     06,3461  3 4711 1  DRFTSUB2  CAF     TWO         PIPAX, PIPAY, PIPAZ
0239  REF  18  LAST  295     06,3462  6 0130 C            AD      BUF
0240  REF  19  LAST  295     06,3463  56 130 C            XCH     BUF
0241  REF  72  LAST  264     06,3464  50 000 1            INDEX   A
0242  REF   7  LAST  295     06,3465  11'471 C            CCS     GCOMP       ARE GYRO COMMANDS 1 PULSE OR GREATER
0243                          06,3466  1 3470 C            TCF     +2          YES
0244  REF  20  LAST  295     06,3467  0 0131 1            TC      BUF +1      NO

0245  REF  10  LAST  252     06,3470  7 7716 1            MASK    NEGONE
0246  REF  73  LAST  295     06,3471  10 000 C            CCS     A           ARE GYRO COMMANDS GREATER THAN 2 PULSES
0247  REF   4  LAST  294     06,3472  55'477 C            TS      GCOMPSW     YES - SET GCOMPSW POSITIVE
0248  REF  21  LAST  295     06,3473  0 0131 1            TC      BUF +1      NO
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0249  REF   2  LAST  29C  06,3474  3 4710 C  1/GYRC   CAF     FOUR          PIPAZ, PIPAY, PIPAX
0250  REF  22  LAST  295  06,3475  54 130 1           TS      BUF

0251  REF  23  LAST  296  06,3476  50 130 C           INDEX   BUF           SCALE GYRO COMMANDS FOR IMUPULSE
0252  REF   8  LAST  295  06,3477  3 1472 1           CA      GCOMP +1      FRACTIONAL PULSES
0253                       06,3500  0 0006 1           EXTEND
0254  REF  18  LAST  197  06,3501  7 4703 C           MP      BIT8          SHIFT RIGHT 7
0255  REF  24  LAST  296  06,3502  50 130 C           INDEX   BUF
0256  REF   9  LAST  296  06,3503  55'472 C           TS      GCOMP +1      FRACTIONAL PULSES SCALED

0257  REF  28  LAST  295  06,3504  3 4714 1           CAF     ZERO          SET GCOMP = 0 FOR DAS INSTRUCTION
0258  REF  25  LAST  296  06,3505  50 130 C           INDEX   BUF
0259  REF  10  LAST  296  06,3506  57'471 1           XCH     GCOMP         GYRO PULSES
0260                       06,3507  0 0006 1           EXTEND
0261  REF  19  LAST  296  06,3510  7 4703 C           MP      BIT8          SHIFT RIGHT 7
0262  REF  26  LAST  296  06,3511  50 130 C           INDEX   BUF
0263  REF  11  LAST  296  06,3512  21'472 C           DAS     GCOMP         ADD THESE TO FRACTIONAL PULSES ABOVE

0264  REF  27  LAST  296  06,3513  10 130 1           CCS     BUF           PIPAZ, PIPAY, PIPAX
0265  REF   2  LAST  291  06,3514  6 7716 C           AD      NEG1
0266  REF   2  LAST  294  06,3515  1 3475 C           TCF     1/GYRC +1
0267  REF  12  LAST  296  06,3516   01471 1  LGCOMP    ECADR   GCOMP         LESS THAN ZERO IMPOSSIBLE

0268  REF   2  LAST  29C  06,3517  3 3516 C           CAF     LGCOMP
0269  REF  35  LAST  256  06,3520  0 4555 C           TC      BANKCALL
027C  REF   2  LAST  236  06,3521   17125 1           CADR    IMUPULSE      CALL GYRO TORQUING ROUTINE
0271  REF  36  LAST  296  06,3522  0 4555 C           TC      BANKCALL
0272  REF   5  LAST  236  06,3523   17516 C           CADR    IMUSTALL      WAIT FOR PULSES TO GET OUT
0273  REF  13  LAST  26C  06,3524  1 5112 1           TCF     ENDOFJOB      TEMPORARY

0274  REF   3  LAST  296  06,3525  3 4710 C  GCOMP1    CAF     FOUR          PIPAZ, PIPAY, PIPAX
0275  REF  28  LAST  296  06,3526  54 130 1           TS      BUF

0276  REF  29  LAST  296  06,3527  50 130 C           INDEX   BUF           RESCALE
0277  REF  13  LAST  296  06,3530  3 1472 1           CA      GCOMP +1
0278                       06,3531  0 0006 1           EXTEND
0279  REF  20  LAST  296  06,3532  7 4703 C           MP      BIT8          SHIFT MINOR PART LEFT 7 - MAJOR PART = 0
0280  REF  30  LAST  296  06,3533  50 130 C           INDEX   BUF
0281  REF  14  LAST  296  06,3534  23'472 1           LXCH    GCOMP +1      BITS 8-14 OF MINOR PART WERE = 0

0282  REF  31  LAST  296  06,3535  10 130 1           CCS     BUF           PIPAZ, PIPAY, PIPAX
0283  REF   3  LAST  296  06,3536  6 7716 C           AD      NEG1
0284  REF   1                    06,3537  1 3526 1           TCF     GCOMP1 +1
0285                       06,3540   01436 1  V06N30S   VN      0630
0286  REF  14  LAST  296  06,3541  1 5112 1           TCF     ENDOFJOB
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0287  REF  5  LAST 295  06,3542  11'477 C  NBDONLY  CCS    GCOMPSW   BYPASS IF GCOMPSW NEGATIVE
0288                    06,3543  1 3546 1           TCF    +3
0289                    06,3544  1 3546 1           TCF    +2
0290  REF 15  LAST 296  06,3545  1 5112 1           TCF    ENDOFJOB

029005                  06,3546  0 0004 C           INHINT
02901 REF  6  LAST 195  06,3547  1C 076 1           CCS    FLAGWRD2  PREREAD T3RUPT MAY COINCIDE
02902 REF 16  LAST 297  06,3550  1 5112 1           TCF    ENDOFJOB
02903 REF 17  LAST 297  06,3551  1 5112 1           TCF    ENDOFJOB
02904                   06,3552  1 3553 C           TCF    +1

0291  REF  4  LAST 214  06,3553  3 0025 C           CA     TIME1     (CS) X 2(+14)
0292  REF  4  LAST 295  06,3554  57'074 C          XCH    1/PIPADT  PREVIOUS TIME
02925                   06,3555  0 0003 1           RELINT
0293                    06,3556  4 0000 C           COM
0294  REF  5  LAST 297  06,3557  6 1074 C           AD     1/PIPADT
0295  REF 74  LAST 295  06,3560  10 000 C  NBD2      CCS    A         CALCULATE ELAPSED TIME
0296  REF 13  LAST 263  06,3561  6 4712 1           AD     ONE       NO TIME1 OVERFLOW
0297  REF  1            06,3562  1 3567 1           TCF    NBD3      RESTORE TIME DIFFERENCE AND JUMP
0298                    06,3563  1 3565 C           TCF    +2        TIME1 OVERFLOW
0299  REF 18  LAST 297  06,3564  1 5112 1           TCF    ENDOFJOB  IF ELAPSED TIME = C  (DIFFERENCE = -0)

0300                    06,3565  4 0000 C           COM               CALCULATE ABSOLUTE DIFFERENCE
0301  REF  6  LAST 185  06,3566  6 4672 C           AD     POSMAX

0302                    06,3567  0 0006 1  NBD3      EXTEND            C(A) = DELTAT    (CS) X 2(+14)
0303  REF 20  LAST 260  06,3570  7 4701 1           MP     BIT10     SHIFT RIGHT 5
0304  REF 18  LAST 294  06,3571  52 123 C           DXCH   VBUF
0305                    06,3572  0 0006 1           EXTEND
0306  REF 19  LAST 297  06,3573  3 0123 1           DCA    VBUF
0307  REF 54  LAST 295  06,3574  52 155 1           DXCH   MPAC      DELTAT NOW SCALED (CS) X 2(+19)

0308  REF 29  LAST 296  06,3575  3 4714 1           CAF    ZERO
0309  REF  6  LAST 297  06,3576  55'477 C          TS     GCOMPSW   INDICATE COMMANDS 2 PULSES OR LESS
0310  REF 32  LAST 296  06,3577  54 130 1           TS     BUF       PIPAX, PIPAY, PIPAZ

0311  REF  5  LAST 294  06,3600  4 1460 C           CS     NBDX      (GYRO PULSES)/(CS) X 2(-5)
0312  REF  1            06,3601  0 3617 1           TC     FBIASSUB  -(NBDX)(DELTAT)   (GYRO PULSES) X 2(+14)

0313                    06,3602  0 0006 1           EXTEND
0314  REF 20  LAST 297  06,3603  4 0123 C           DCS    VBUF
0315  REF 55  LAST 297  06,3604  52 155 1           DXCH   MPAC      DELTAT SCALED (CS) X 2(+19)
0316  REF  2  LAST 292  06,3605  3 1461 C           CA     NBDY      (GYRO PULSES)/(CS) X 2(-5)
0317  REF  2  LAST 297  06,3606  0 3617 1           TC     FBIASSUB  -(NBDY)(DELTAT)   (GYRO PULSES) X 2(+14)

0318                    06,3607  0 0006 1           EXTEND
0319  REF 21  LAST 297  06,3610  4 0123 C           DCS    VBUF
0320  REF 56  LAST 297  06,3611  52 155 1           DXCH   MPAC      DELTAT SCALED (CS) X 2(+19)
0321  REF  2  LAST 293  06,3612  4 1462 1           CS     NBDZ      (GYRO PULSES)/(CS) X 2(-5)
0322  REF  3  LAST 297  06,3613  0 3617 1           TC     FBIASSUB  +(NBDZ)(DELTAT)   (GYRO PULSES) X 2(+14)
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L IMU COMPENSATION PACKAGE USER'S PAGE NO. 9 E3 S3

0323	REF	7	LAST	297	06,3614	11'477 0	CCS	GCOMPSW
0324	REF	3	LAST	296	06,3615	1 3474 1	TCF	1/GYRC
0325	REF	19	LAST	297	06,3616	1 5112 1	TCF	ENDOFJOB

ARE GYRO COMMANDS GREATER THAN 2 PULSES
YES
NO

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0326   REF  35  LAST  294   06,3617  56 002 C  FBIASSUB XCH    Q
0327   REF  33  LAST  297   06,3620  54 131 C            TS     BUF +1

0328   REF  36  LAST  299   06,3621  3 0002 C            CA     Q          NBD SCALED (GYRO PULSES)/(CS) X 2(-5)
0329                        06,3622  0 0006 1            EXTEND
0330   REF  57  LAST  297   06,3623  7 0154 C            MP     MPAC       DELTAT SCALED (CS) X 2(+19)
0331   REF  34  LAST  299   06,3624  50 130 C            INDEX  BUF
0332   REF  15  LAST  296   06,3625  21'472 C            DAS    GCOMP      HI(NBD)(DELTAT)   (GYRO PULSES) X 2(+14)

0333   REF  37  LAST  299   06,3626  3 0002 C            CA     Q          NOW FRACTIONAL PART
0334                        06,3627  0 0006 1            EXTEND
0335   REF  58  LAST  299   06,3630  7 0155 1            MP     MPAC +1
0336   REF  24  LAST  299   06,3631  54 001 1            TS     L
0337   REF  30  LAST  297   06,3632  3 4714 1            CAF    ZERO
0338   REF  35  LAST  299   06,3633  50 130 C            INDEX  BUF
0339   REF  16  LAST  299   06,3634  21'472 C            DAS    GCOMP      (NBD)(DELTAT)     (GYRO PULSES) X 2(+14)

0340   REF   1              06,3635  1 3461 C            TCF    DRFTSUB2   CHECK MAGNITUDE OF COMPENSATION


03401  REF  37  LAST  296   06,3636  0 4555 C  LASTBIAS TC     BANKCALL
03402  REF   1              06,3637   17075 C            CADR   PIPUSE

0341   REF   8  LAST  298   06,3640  11'477 C            CCS    GCOMPSW    BYPASS IF GCOMPSW NEGATIVE
0342                        06,3641  1 3644 C            TCF    +3
0343                        06,3642  1 3644 C            TCF    +2
0344   REF  20  LAST  298   06,3643  1 5112 1            TCF    ENDOFJOB

0345   REF   1              06,3644  3 7665 C            CAF    PRIO31     2 SECONDS SCALED (CS) X 2(+8)
0346   REF   6  LAST  297   06,3645  57'074 C            XCH    1/PIPADT
0347                        06,3646  4 0000 C            COM
0348   REF   4  LAST  173   06,3647  6 1246 C            AD     PIPTIME1 +1    TIME AT PIPA1 =0
0349   REF   1              06,3650  1 3560 C            TCF    NBD2
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R0001   PROGRAM NAME - KEYBOARD AND DISPLAY PROGRAM
R0002   MOD NO - 4      DATE - 27 APRIL 1967      ASSEMBLY - PINDISK REV 17
R0003   MOD BY - FILENE
R0004   LOG SECTION - PINBALL GAME  BUTTONS AND LIGHTS

R0009   FUNCTIONAL DESCRIPTION-

R0010      THE KEYBOARD AND DISPLAY SYSTEM PROGRAM OPERATES UNDER EXECUTIVE
R0011   CONTROL AND PROCESSES INFORMATION EXCHANGED BETWEEN THE AGC AND THE
R0012   COMPUTER OPERATOR.  THE INPUTS TO THE PROGRAM ARE FROM THE KEYBOARD,
R0013   FROM INTERNAL PROGRAMS, AND FROM THE UPLINK.
R0014      THE LANGUAGE OF COMMUNICATION WITH THE PROGRAM IS A PAIR OF WORDS
R0015   KNOWN AS VERB AND NOUN.  EACH OF THESE IS REPRESENTED BY A 2 CHARACTER
R0016   DECIMAL NUMBER.  THE VERB CODE INDICATES WHAT ACTION IS TO BE TAKEN, THE
R0017   NOUN CODE INDICATES TO WHAT THIS ACTION IS APPLIED.  NOUNS USUALLY
R0018   REFER TO A GROUP OF ERASABLE REGISTERS.

R0020   VERBS ARE GROUPED INTO DISPLAYS, LOADS, MONITORS (DISPLAYS THAT ARE
R0021   UPDATED ONCE PER SECOND), SPECIAL FUNCTIONS, AND EXTENDED VERBS(THESE
R0022   ARE OUTSIDE OF THE DOMAIN OF PINBALL AND CAN BE FOUND UNDER LOG SECTION
R0023   :EXTENDED VERBS:).
R0024   A LIST OF VERBS AND NOUNS IS GIVEN IN LOG SECTION :ASSEMBLY AND
R0025   OPERATION INFORMATION:.

R0026   CALLING SEQUENCES-

R0027   KEYBOARD:
R0028      EACH DEPRESSION OF A MAIN (NAVIGATION) KEYBOARD BUTTON ACTIVATES
R0029   INTERRUPT KEYRUPT1 (KEYRUPT2) AND PLACES THE 5 BIT KEY CODE INTO
R00291  CHANNEL 15 (CHANNEL 16).  KEYRUPT1 (KEYRUPT2) PLACES THE KEY
R0030   CODE INTO MPAC, ENTERS AN EXECUTIVE REQUEST FOR THE KEYBOARD AND DISPLAY
R0031   PROGRAM (AT :CHARIN:), AND EXECUTES A RESUME.

R0032   UPLINK:
R0033      EACH WORD RECEIVED BY THE UPLINK ACTIVATES INTERRUPT UPRUPT WHICH
R0034   PLACES THE 5 BIT KEY CODE INTO MPAC, ENTERS AN EXECUTIVE REQUEST FOR THE
R0035   KEYBOARD AND DISPLAY PROGRAM (AT:CHARIN:) AND EXECUTES A RESUME.

R0036   INTERNAL PROGRAMS:
R0037      INTERNAL PROGRAMS CALL PINBALL AT :NVSUB: WITH THE DESIRED VERB/NOUN
R0038   CODE IN A (LOW 7 BITS FOR NOUN, NEXT 7 BITS FOR VERB).  DETAILS
R0039   DESCRIBED ON REMARKS CARDS JUST BEFORE :NVSUB: AND :NVSBWAIT: (SEE
R0040   SYNECL TABLE FOR PAGE NUMBERS).


R0045   NORMAL EXIT MODES-

R0046      IF PINBALL WAS CALLED BY EXTERNAL ACTION, THERE ARE FOUR EXITS:
R004605          1) ALL BUT (2), (3), AND (4) EXIT DIRECTLY TO ENDOFJOB.
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R00461 2) EXTENDED VERBS GO TO THE EXTENDED VERB FAN AS PART OF THE
R00462 PINBALL EXECUTIVE JOB WITH PRIORITY 30000. IT IS THE
R00463 RESPONSIBILITY OF THE EXTENDED VERB CALLED TO EVENTUALLY
R00464 CHANGE PRIORITY (IF NECESSARY) AND DO AN ENDOFJOB.
R00465 ALSO PINBALL IS A NOVAC JOB. EBANK SET FOR COMMON.
R00466 3) VERB 37. CHANGE OF PROGRAM (MAJOR MODE) CALLS :V37: IN THE
R00467 SERVICE ROUTINES AS PART OF THE PINBALL EXEC JOB WITH PRIO
R00468 30000. THE NEW PROGRAM CODE (MAJOR MODE) IS LEFT IN A.
R00469 4) KEY RELEASE BUTTON CALLS :PINBRNCH: IN THE DISPLAY INTERFACE
R00470 ROUTINES AS PART OF THE PINBALL EXEC JOB WITH PRIO 30000 IF
R00471 THE KEY RELEASE LIGHT IS OFF AND :CADRSTOR: IS NOT +0.

R00472 IF PINBALL WAS CALLED BY INTERNAL PROGRAMS, EXIT FROM PINBALL IS BACK
R00473 TO CALLING ROUTINE. DETAILS DESCRIBED IN REMARKS CARDS JUST BEFORE
R00474 :NVSUB: AND :NVSBWAIT: (SEE SYMBOL TABLE FOR PAGE NUMBERS).

R00475 ALARM OR ABORT EXIT MODES-

R00476 EXTERNAL INITIATION:
R00477 IF SOME IMPROPER SEQUENCE OF KEY CODES IS DETECTED, THE OPERATOR
R00478 ERROR LIGHT IS TURNED ON AND EXIT IS TO :ENDOFJOB:.

R00479 INTERNAL PROGRAM INITIATION:
R00480 IF AN ILLEGAL V/N COMBINATION IS ATTEMPTED, AN ABORT IS CAUSED
R00481 (WITH OCTAL 01501).
R00482 IF A SECOND ATTEMPT IS MADE TO GO TO SLEEP IN PINBALL, AN ABORT IS
R00483 CAUSED (WITH OCTAL 01206). THERE ARE TWO WAYS TO GO TO SLEEP IN PINBALL:
R00484 1) ENDIDLE OR DATAWAIT.
R00485 2) NVSBWAIT, PRENVBSY, OR NVSUBUSY.

R00486 CONDITIONS LEADING TO THE ABOVE ARE DESCRIBED IN FORTHCOMING MIT/IL
R00487 E-REPORT DESCRIBING KEYBOARD AND DISPLAY OPERATION FOR 278.

R00488 OUTPUT-

R00489 INFORMATION TO BE SENT TO THE DISPLAY PANEL IS LEFT IN THE :DSPTAB:
R00490 BUFFERS REGISTERS (UNDER EXEC CONTROL). :DSPOUT: (A PART OF T4RUPT)
R00491 HANDLES THE PLACING OF THE :DSPTAB: INFORMATION INTO OUTPUT CHANNEL 10
R00492 IN INTERRUPT.

R00493 ERASABLE INITIALIZATION-

R00494 FRESH START AND RESTART INITIALIZE THE NECESSARY E REGISTERS FOR
R00495 PINBALL IN :STARTSUB:. REGISTERS ARE: DSPTAB BUFFER, CADRSTOR,
R00496 REGRET, CLPASS, DSPLOCK, NONSAVE, NONSAVE1, VERBREG, NOUNREG, DSPLIST,
R00497 DSPCOUNT, NOUT.

R0069 A COMPLETE LIST OF ALL THE ERASABLES (BOTH RESERVED AND TEMPORARIES) FOR
R0070 PINBALL IS GIVEN BELOW.

R0071 THE FOLLOWING ARE OF GENERAL INTEREST-

R0072 REMARKS CARDS PRECEDE THE REFERENCED SYMBOL DEFINITION. SEE SYMBOL
R0073 TABLE TO FIND APPROPRIATE PAGE NUMBERS.

R0074 NVSUB CALLING POINT FOR INTERNAL USE OF PINBALL.
R0075 OF RELATED INTEREST NVSBWAIT
R0076 NVSUBUSY
R0077 PRENVBSY

R0083 ENDIDLE ROUTINE FOR INTERNAL PROGRAMS WISHING TO GO TO SLEEP WHILE
R0084 AWAITING OPERATORS RESPONSE.

R00851 DSPMM ROUTINE BY WHICH AN INTERNAL PROGRAM MAY DISPLAY A DECIMAL
R00852 PROGRAM CODE (MAJOR MODE) IN THE PROGRAM (MAJOR MODE) LIGHTS.
R008525 (DSPMM DOES NOT DISPLAY DIRECTLY BUT ENTERS EXEC REQUEST
R008527 FOR DSPMMJB WITH PRIO 30000 AND RETURNS TO CALLER.)

R00853 BLANKSUB ROUTINE BY WHICH AN INTERNAL PROGRAM MAY BLANK ANY
R00854 COMBINATION OF THE DISPLAY REGISTERS R1, R2, R3.

R00855 JAMTERM ROUTINES BY WHICH AN INTERNAL PROGRAM MAY PERFORM THE
R00856 JAMPROC TERMINATE (V 34) OR PROCEED (V 33) FUNCTION.

R0086 MONITOR VERBS FOR PERIODIC (1 PER SEC) DISPLAY.

R00861 PLEASE PERFORM, PLEASE MARK SITUATIONS
R00862 REMARKS DESCRIBING HOW AN INTERNAL ROUTINE SHOULD HANDLE
R00863 THESE SITUATIONS CAN BE FOUND JUST BEFORE :NVSUB: (SEE
R00864 SYMBOL TABLE FOR PAGE NUMBER).

R0087 THE NOUN TABLE FORMAT IS DESCRIBED ON A PAGE OF REMARKS CARDS JUST
R0088 BEFORE :DSPABC: (SEE SYMBOL TABLE FOR PAGE NUMBER).

R0089 THE NOUN TABLES THEMSELVES ARE FOUND IN LOG SECTION :PINBALL NOUN
R00891 TABLES:.

R0090 FOR FURTHER DETAILS ABOUT OPERATION OF THE KEYBOARD AND DISPLAY SYSTEM
R0091 PROGRAM, SEE THE MISSION PLAN AND/OR MIT/IL E-2129
R0092 DESCRIBING KEYBOARD AND DISPLAY OPERATION FOR 278.

R0150 THE FOLLOWING QUOTATION IS PROVIDED THROUGH THE COURTESY OF THE AUTHORS.

R0151 ::IT WILL BE PROVED TO THY FACE THAT THOU HAST MEN ABOUT THEE THAT

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R0152   USUALLY TALK OF A NOUN AND A VERB, AND SUCH ABOMINABLE WORDS AS NO
R0153   CHRISTIAN EAR CAN ENDURE TO HEAR.::

R0154                          HENRY 6, ACT 2, SCENE 4


R0155   THE FOLLOWING ASSIGNMENTS FOR PINBALL ARE MADE ELSEWHERE


R0156   RESERVED FOR PINBALL EXECUTIVE ACTION

R0157   DSPCOUNT ERASE                  DISPLAY POSITION INDICATOR
R0158   DECBRNCH ERASE                  +DEC, - DEC, OCT INDICATOR
R0159   VERBREG  ERASE                  VERB CODE
R0160   NOUNREG  ERASE                  NOUN CODE
R0161   XREG     ERASE                  R1 INPUT BUFFER
R0162   YREG     ERASE                  R2 INPUT BUFFER
R0163   ZREG     ERASE                  R3 INPUT BUFFER
R0164   XREGLP   ERASE                  LO PART OF XREG (FOR DEC CONV ONLY)
R0165   YREGLP   ERASE                  LO PART OF YREG (FOR DEC CONV ONLY)
R0166   HITEMOUT =      YREGLP          TEMP FOR DISPLAY OF HRS, MIN, SEC
R0167                                           MUST = LOTEMOUT-1.
R0168   ZREGLP   ERASE                  LO PART OF ZREG (FOR DEC CONV ONLY)
R0169   LOTEMOUT =      ZREGLP          TEMP FOR DISPLAY OF HRS, MIN, SEC
R0170                                           MUST = HITEMOUT+1.
R0171   MODREG   ERASE                  MODE CODE
R0172   DSPLOCK  ERASE                  KEYBOARD/SUBROUTINE CALL INTERLOCK
R0173   REGRET   ERASE                  RETURN REGISTER FOR LOAD
R0174   LOADSTAT ERASE                  STATUS INDICATOR FOR LOADTST
R0175   CLPASS   ERASE                  PASS INDICATOR CLEAR
R0176   NOUT     ERASE                  ACTIVITY COUNTER FOR DSPTAB
R0177   NOUNCADR ERASE                  MACHINE CADR FOR NOUN
R0178   MONSAVE  ERASE                  N/V CODE FOR MONITOR. (= MONSAVE1-1)
R0179   MONSAVE1 ERASE                  NOUNCADR FOR MONITOR(MATBS) =MONSAVE +1
R01795  MONSAVE2 ERASE                  NVMONOPT OPTIONS
R0180   DSPTAB   ERASE          +13D    0-10,DISPLAY PANEL BUFFER.11-13,C RELAYS
R0181   CADRSTOR ERASE                  ENDIDLE STORAGE
R0182   NVQTEM   ERASE                  NVSUB STORAGE FOR CALLING ADDRESS
R0183                                   MUST = NVBNKTEM-1
R0184   NVBNKTEM ERASE                  NVSUB STORAGE FOR CALLING BANK
R0185                                   MUST = NVQTEM+1
R0186   VERBSAVE ERASE                  NEEDED FOR RECYCLE
R0187   DSPLIST  ERASE                  WAITING REG FOR DSP SYST INTERNAL USE
R0188   EXTVBACT REASE                  EXTENDED VERB ACTIVITY INTERLOCK
R0189   DSPTEM1  ERASE          +2      BUFFER STORAGE AREA 1 (MOSTLY FOR TIME)
R0190   DSPTEM2  ERASE          +2      BUFFER STORAGE AREA 2 (MOSTLY FOR DEG)
R0191   END OF ERASABLES RESERVED FOR PINBALL EXECUTIVE ACTION


R0192   TEMPORARIES FOR PINBALL EXECUTIVE ACTION
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```
R0193   DSEXIT   =       INTB15+         RETURN FOR DSPIN
R0194   EXITEM   =       INTB15+         RETURN FOR SCALE FACTOR ROUTINE SELECT
R0195   BLANKRET =       INTB15+         RETURN FOR 2BLANK

R0196   WRDRET   =       INTBIT15        RETURN FOR 5BLANK
R0197   WDRET    =       INTBIT15        RETURN FOR DSPWD
R0198   DECRET   =       INTBIT15        RETURN FOR PUTCOM(DEC LOAD)
R0199   21/22REG =       INTBIT15        TEMP FOR CHARIN

R0200   UPDATRET =       PCLISH          RETURN FOR UPDATNN, UPDATVB
R0201   CHAR     =       PCLISH          TEMP FOR CHARIN
R0202   ERCNT    =       PCLISH          COUNTER FOR ERROR LIGHT RESET
R0203   DECOUNT  =       PCLISH          COUNTER FOR SCALING AND DISPLAY (DEC)

R0204   SGNCN    =       VBUF            TEMP FOR +,- ON
R0205   NOUNTEM  =       VBUF            COUNTER FOR MIXNOUN FETCH
R0206   OUTEM    =       VBUF            COUNTER FOR OCTAL DISPLAY VERBS
R0207   DECTEM   =       VBUF            COUNTER FOR FETCH (DEC DISPLAY VERBS)

R0208   SGNOFF   =       VBUF    +1      TEMP FOR +,- ON
R0209   NVTEMP   =       VBUF    +1      TEMP FOR NVSUB
R0210   SFTEMP1  =       VBUF    +1      STORAGE FOR SF CONST HI PART(=SFTEMP2-1)
R0211   HITEMIN  =       VBUF    +1      TEMP FOR LOAD OF HRS, MIN, SEC
R0212                                            MUST = LOTEMIN-1.
R0213   CODE     =       VBUF    +2      FOR DSPIN
R0214   SFTEMP2  =       VBUF    +2      STORAGE FOR SF CONST LO PART(=SFTEMP1+1)
R0215   LOTEMIN  =       VBUF    +2      TEMP FOR LOAD OF HRS, MIN, SEC
R0216                                            MUST = HITEMIN+1.
R0217   MIXTEMP  =       VBUF    +3      FOR MIXNOUN DATA
R0218   SIGNRET  =       VBUF    +3      RETURN FOR +,- ON

R0219   ALSO MIXTEMP+1 = VBUF+4, MIXTEMP+2 = VBUF+5.

R0220   ENTRET   =       DOTINC          EXIT FROM ENTER

R0221   WDCNT    =       DOTRET          CHAR COUNTER FOR DSPWD
R0222   INREL    =       DOTRET          INPUT BUFFER SELECTOR ( X,Y,Z, REG )

R0223   DSPMMTEM =       MATINC          DSPCOUNT SAVE FOR DSPMM
R0224   MIXER    =       MATINC          INDICATOR FOR MIXED OR NORMAL NOUN

R0225   TEM1     ERASE                   EXEC TEMP
R0226   DSREL    =       TEM1            REL ADDRESS FOR DSPIN

R0227   TEM2     ERASE                   EXEC TEMP
R0228   DSMAG    =       TEM2            MAGNITUDE STORE FOR DSPIN
R0229   IOADDTEM =       TEM2            MIXNOUN INDIRECT ADDRESS STORAGE

R0230   TEM3     ERASE                   EXEC TEMP
R0231   COUNT    =       TEM3            FOR DSPIN
```

```
R0232   TEM4     ERASE                 EXEC TEMP
R0233   LSTPTR   =      TEM4           LIST POINTER FOR GRABUSY
R0234   RELRET   =      TEM4           RETURN FOR RELDSP
R0235   FREERET  =      TEM4           RETURN FOR FREEDSP
R0236   DSPWDRET =      TEM4           RETURN FOR DSPSIGN
R0237   SEPSCRET =      TEM4           RETURN FOR SEPSEC
R0238   SEPMNRET =      TEM4           RETURN FOR SEPMIN

R0239   TEM5     ERASE                 EXEC TEMP
R0240   NOUNADD  =      TEM5           TEMP STORAGE FOR NOUN ADDRESS

R0241   NNADTEM  ERASE                 TEMP FOR NOUN ADDRESS TABLE ENTRY
R0242   NNTYPTEM ERASE                 TEMP FOR NOUN TYPE TABLE ENTRY
R0243   IDAD1TEM ERASE                 TEMP FOR INDIR ADRESS TABLE ENTRY(MIXNN)
R0244                                  MUST = IDAD2TEM-1, = IDAD3TEM-2.
R0245   IDAD2TEM ERASE                 TEMP FOR INDIR ADRESS TABLE ENTRY(MIXNN)
R0246                                  MUST = IDAD1TEM+1, = IDAD3TEM-1.
R0247   IDAD3TEM ERASE                 TEMP FOR INDIR ADRESS TABLE ENTRY(MIXNN)
R0248                                  MUST = IDAD1TEM+2, = IDAD2TEM+1.
R0249   RUPNXTEM ERASE                 TEMP FOR SF ROUT TABLE ENTRY(MIXNN ONLY)
R0250   END OF TEMPORARIES FOR PINBALL EXECUTIVE ACTION


R02501  ADDITIONAL TEMPORARIES FOR PINBALL EXECUTIVE ACTION

R02502  MPAC, THRU MPAC +6
R02503  BUF, +1, +2
R02504  BUF2, +1, +2
R02506  MPTEMP
R02507  ACCRWD
R02509    END OF ADDITIONAL TEMPS FOR PINBALL EXEC ACTION


R0251   RESERVED FOR PINBALL INTERRUPT ACTION

R0252   DSPCNT   ERASE                 COUNTER FOR DSPOUT
R0253   UPLOCK   ERASE                 BIT1 = UPLINK INTERLOCK (ACTIVATED BY
A0254                                                  RECEPTION OF A BAD MESSAGE IN UPLINK)
R0255   END OF ERASABLES RESERVED FOR PINBALL INTERRUPT ACTION


R0256   TEMPORARIES FOR PINBALL INTERRUPT ACTION

R0257   KEYTEMP1 =      WAITEXIT       TEMP FOR KEYRUPT, UPRUPT
R0258   DSRUPTEM =      WAITEXIT       TEMP FOR DSPOUT
R0259   KEYTEMP2 =      RUPTAGN        TEMP FOR KEYRUPT, UPRUPT
R0260   END OF TEMPORARIES FOR PINBALL INTERRUPT ACTION
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P0261   THE INPUT CODES ASSUMED FOR THE KEYBOARD ARE,
R0262   0          10000
R0263   1          00001
R0264   9          01001
R0265   VERB       10001
R0266   ERROR RES  10010
R0267   KEY RLSE   11001
R0268   +          11010
R0269   -          11011
R0270   ENTER      11100
R0271   CLEAR      11110
R0272   NOUN       11111


R0273   OUTPUT FORMAT FOR DISPLAY PANEL. SET OUTO TO  AAAABCCCCCDDDDD.
R0274   A-5 SELECT A RELAYWORD. THIS DETERMINES WHICH PAIR OF CHARACTERS ARE
R0275   ENERGIZED.
R0276   B FOR SPECIAL RELAYS SUCH AS SIGNS ETC.
R0277   C-5  5 BIT RELAY CODE FOR LEFT CHAR OF PAIR SELECTED BY RELAYWORD
R0278   D-5  5 BIT RELAY CODE FOR RIGHTCHAR OF PAIR SELECTED BY RELAYWORD.

R0279   THE PANEL APPEARS AS FOLLOWS,
R0280   MD1    MD2                              (MAJOR MODE)
R0281   VD1    VD2 (VERB)    ND1    ND2         (NOUN)
R0282   R1D1   R1D2   R1D3   R1D4   R1D5   (R1)
R0283   R2D1   R2D2   R2D3   R2D4   R2D5   (R2)
R0284   R3D1   R3D2   R3D3   R3D4   R3D5   (R3)

R0285   EACH OF THESE IS GIVEN A DSPCOUNT NUMBER FOR USE WITHIN COMPUTATION ONLY
R0286   MD1   25      R2D1  11          ALL ARE OCTAL
R0287   MD2   24      R2D2  10
R0288   VD1   23      R2D3   7
R0289   VD2   22      R2D4   6
R0290   ND1   21      R2D5   5
R0291   ND2   20      R3D1   4
R0292   R1D1  16      R3D2   3
R0293   R1D2  15      R3D3   2
R0294   R1D3  14      R3D4   1
R0295   R1D4  13      R3D5   0
R0296   R1D5  12

R0297   THERE IS AN 11 REGISTER TABLE (DSPTAB) FOR THE DISPLAY PANEL.

R0298   DSPTAB RELAYWD       BIT11     BITS 10-6     BITS 5-1
R0299   RELADD
R0300   10     1011                    MD1  (25)     MD2  (24)
R0301   9      1010                    VD1  (23)     VD2  (22)
R0302   8      1001                    ND1  (21)     ND2  (20)
R0303   7      1000                                  R1D1 (16)
```

```
R0304   6       0111            +R1     R1D2 (15)       R1D3 (14)
R0305   5       0110            -R1     R1D4 (13)       R1D5 (12)
R0306   4       0101            +R2     R2D1 (11)       R2D2 (10)
R0307   3       0100            -R2     R2D3 (7)        R2D4 (6)
R0308   2       0011                    R2D5 (5)        R3D1 (4)
R0309   1       0010            +R3     R3D2 (3)        R3D3 (2)
R0310   0       0001            -R3     R3D4 (1)        R3D5 (0)
R0311           0000    NO RELAYWORD

R0312   THE 5 BIT OUTPUT RELAY CODES ARE:
R0313   BLANK       00000
R0314   0           10101
R0315   1           00011
R0316   2           11001
R0317   3           11011
R0318   4           01111
R0319   5           11110
R0320   6           11100
R0321   7           10011
R0322   8           11101
R0323   9           11111
```

```
R03231  OUTPUT BITS USED BY PINBALL:

R03232          KEY RELEASE LIGHT     - BIT 5 OF CHANNEL 11
R03233          VERB/NOUN FLASH       - BIT 6 OF CHANNEL 11
R03234          OPERATOR ERROR LIGHT  - BIT 7 OF CHANNEL 11
```

P0324 START OF EXECUTIVE SECTION OF PINBALL

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0325                              40,2000                    BANK   40
032501 REF    1                   40,2000                    SETLOC PINBALL1
032502                            40,2000                    BANK

03255  REF    1                                              COUNT  40/PIN

0330   REF   14  LAST  297        40,2000  3 4712 1  CHARIN  CAF    ONE        BLOCK DISPLAY SYST
0331   REF    2  LAST  187        40,2001  57*012 0          XCH    DSPLOCK    MAKE DSP SYST BUSY, BUT SAVE OLD
0332   REF    1                   40,2002  54 115 0          TS     21/22REG   C(DSPLOCK) FOR ERROR LIGHT RESET.
03321  REF    2  LAST  187        40,2003  11*042 1          CCS    CADRSTOR   ALL KEYS EXCEPT ER TURN ON KR LITE IF
03322                             40,2004  0 2006 0          TC     +2         CADRSTOR IS FULL.  THIS REMINDS OPERATOR
03323  REF    1                   40,2005  0 2013 1          TC     CHARIN2    TO RE-ESTABLISH A FLASHING DISPLAY
03324  REF    1                   40,2006  4 2057 0          CS     ELRCODE1   WHICH HE HAS OBSCURED WITH DISPLAYS OF
03325  REF   59  LAST  299        40,2007  6 0154 1          AD     MPAC       HIS OWN (SEE REMARKS PRECEDING ROUTINE
03326                             40,2010  0 0006 1          EXTEND            VBRELDSP).
03327  REF    2  LAST  308        40,2011  1 2013 0          BZF    CHARIN2
03328  REF    1                   40,2012  0 4410 0          TC     RELDSPCN
0333   REF   60  LAST  308        40,2013  56 154 1  CHARIN2 XCH    MPAC
0334   REF    1                   40,2014  54 117 1          TS     CHAR
0335   REF   75  LAST  297        40,2015  50 000 1          INDEX  A
0336                              40,2016  0 2017 0          TC     +1         INPUT CODE     FUNCTION
0337   REF    1                   40,2017  0 3335 1          TC     CHARALRM   0
0338   REF    1                   40,2020  0 2076 1          TC     NUM        1
0339   REF    2  LAST  308        40,2021  0 2076 1          TC     NUM        2
0340   REF    3  LAST  308        40,2022  0 2076 1          TC     NUM        3
0341   REF    4  LAST  308        40,2023  0 2076 1          TC     NUM        4
0342   REF    5  LAST  308        40,2024  0 2076 1          TC     NUM        5
0343   REF    6  LAST  308        40,2025  0 2076 1          TC     NUM        6
0344   REF    7  LAST  308        40,2026  0 2076 1          TC     NUM        7
0345   REF    1                   40,2027  0 2062 1          TC     89TEST     10             8
0346   REF    2  LAST  308        40,2030  0 2062 1          TC     89TEST     11             9
0347   REF    2  LAST  308        40,2031  0 3335 1          TC     CHARALRM   12
0348   REF    3  LAST  308        40,2032  0 3335 1          TC     CHARALRM   13
0349   REF    4  LAST  308        40,2033  0 3335 1          TC     CHARALRM   14
0350   REF    5  LAST  308        40,2034  0 3335 1          TC     CHARALRM   15
0351   REF    6  LAST  308        40,2035  0 3335 1          TC     CHARALRM   16
0352   REF    7  LAST  308        40,2036  0 3335 1          TC     CHARALRM   17
0353   REF    8  LAST  308        40,2037  0 2074 0          TC     NUM    -2  20             0
0354   REF    1                   40,2040  0 2255 1          TC     VERB       21             VERB
0355   REF    1                   40,2041  0 3504 0          TC     ERROR      22             ERROR LIGHT RESET
0356   REF    8  LAST  308        40,2042  0 3335 1          TC     CHARALRM   23
0357   REF    9  LAST  308        40,2043  0 3335 1          TC     CHARALRM   24
0358   REF   10  LAST  308        40,2044  0 3335 1          TC     CHARALRM   25
0359   REF   11  LAST  308        40,2045  0 3335 1          TC     CHARALRM   26
0360   REF   12  LAST  308        40,2046  0 3335 1          TC     CHARALRM   27
0361   REF   13  LAST  308        40,2047  0 3335 1          TC     CHARALRM   30
0362   REF    1                   40,2050  0 3362 0          TC     VBRELDSP   31             KEY RELEASE
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0363   REF   1              40,2051  0 2310 1          TC     POSGN       32          +
0364   REF   1              40,2052  0 2275 C          TC     NEGSGN      33          -
0365   REF   1              40,2053  0 2060 C          TC     ENTERJMP    34          ENTER
0366   REF  14  LAST  308   40,2054  0 3335 1          TC     CHARALRM    35
0367   REF   1              40,2055  0 2370 1          TC     CLEAR       36          CLEAR
0368   REF   1              40,2056  0 2271 1          TC     NOUN        37          NOUN

03685                       40,2057   00022 1 ELRCODE1 OCT    22
0369   REF  15  LAST  260   40,2060  0 4574 C ENTERJMP TC     POSTJUMP
0370   REF   1              40,2061   62002 1          CADR   ENTER

0371   REF   3  LAST  187   40,2062  10 777 1 89TEST   CCS    DSPCOUNT
0372                        40,2063  0 2067 1          TC     +4          +
0373                        40,2064  0 2067 1          TC     +3          +0
0374   REF  21  LAST  299   40,2065  0 5112 C          TC     ENDOFJOB    - BLOCK DATA IN IF DSPCOUNT IS - OR -0
0375   REF  22  LAST  309   40,2066  0 5112 C          TC     ENDOFJOB    -0
0376   REF   2  LAST   32   40,2067  3 6214 C          CAF    THREE
0377   REF   1              40,2070  7 1000 1          MASK   DECBRNCH
0378   REF  76  LAST  308   40,2071  10 000 C          CCS    A
0379   REF   9  LAST  308   40,2072  0 2076 1          TC     NUM         IF DECBRNCH IS +, 8 OR 9 OK
0380   REF  15  LAST  309   40,2073  0 3335 1          TC     CHARALRM    IF DECBRNCH IS +0, REJECT 8 OR 9
```

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R0381   NUM ASSEMBLES OCTAL 3 BITS AT A TIME. FOR DECIMAL IT CONVERTS INCOMING
R0382   WORD AS A FRACTION, KEEPING RESULTS TO DP.
R0383   OCTAL RESULTS ARE LEFT IN XREG, YREG, OR ZREG. HI PART OF DEC IN XREG,
R0384   YREG, ZREG. THE LOW PARTS IN XREGLP, YREGLP, OR ZREGLP)
R0385   DECBRNCH IS LEFT AT 40 FOR OCT, +1 FOR + DEC, +2 FOR - DEC.
R0386   IF DSPCOUNT WAS LEFT -, NO MORE DATA IS ACCEPTED.

0387   REF  31  LAST  299   40,2074  3 4714 1          CAF    ZERO
0388   REF   2  LAST  308   40,2075  54 117 1          TS     CHAR
0389   REF   4  LAST  309   40,2076  10 777 1 NUM      CCS    DSPCOUNT
0390                        40,2077  0 2103 1          TC     +4          +
0391                        40,2100  0 2103 1          TC     +3          +0
0392                        40,2101  0 2102 C          TC     +1          -BLOCK DATA IN IF DSPCOUNT IS -
0393   REF  23  LAST  309   40,2102  0 5112 C          TC     ENDOFJOB    -0
0394   REF   1              40,2103  0 2225 C          TC     GETINREL
0395   REF   2  LAST  187   40,2104  11'015 C          CCS    CLPASS      IF CLPASS IS + OR +0, MAKE IT +0.
0396   REF  32  LAST  309   40,2105  3 4714 1          CAF    ZERO
0397   REF   3  LAST  309   40,2106  55'015 C          TS     CLPASS
0398                        40,2107  0 2110 C          TC     +1
0399   REF   3  LAST  309   40,2110  50 117 C          INDEX  CHAR
0400   REF   2  LAST  130   40,2111  3 4072 C          CAF    RELTAB
0401   REF   2  LAST  226   40,2112  7 4362 C          MASK   LOW5
0402   REF   1              40,2113  54 124 1          TS     CODE
0403   REF   5  LAST  309   40,2114  3 0777 C          CA     DSPCOUNT
0404   REF   1              40,2115  54 143 C          TS     COUNT
0405   REF   1              40,2116  0 3225 1          TC     DSPIN
```

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0406   REF   3  LAST  309   40,2117  3 6214 C          CAF    THREE
0407   REF   2  LAST  309   40,2120  7 1000 1          MASK   DECBRNCH
0408   REF  77  LAST  309   40,2121  10 000 C          CCS    A          +0, OCTAL.  +1, + DEC.  +2, - DEC.
0409   REF   1              40,2122  0 2133 1          TC     DECTCBIN   +
0410   REF   1              40,2123  50 137 1          INDEX  INREL      +0 OCTAL
0411   REF   2  LAST  187   40,2124  57'001 1          XCH    VERBREG
0412   REF   1              40,2125  54 022 C          TS     CYL
0413   REF   2  LAST  310   40,2126  4 0022 C          CS     CYL
0414   REF   3  LAST  310   40,2127  4 0022 C          CS     CYL
0415   REF   4  LAST  310   40,2130  56 022 1          XCH    CYL
0416   REF   4  LAST  309   40,2131  6 0117 C          AD     CHAR
0417   REF   1              40,2132  0 2150 1          TC     ENDNMTST
0418   REF   2  LAST  310   40,2133  50 137 1 DECTCBIN INDEX  INREL
0419   REF   3  LAST  310   40,2134  57'001 1          XCH    VERBREG
0420   REF  61  LAST  308   40,2135  54 154 C          TS     MPAC       SUM X 2EXP-14 IN MPAC
0421   REF  33  LAST  309   40,2136  3 4714 1          CAF    ZERO
0422   REF  62  LAST  310   40,2137  54 155 1          TS     MPAC   +1
0423   REF   2  LAST  186   40,2140  3 4377 C          CAF    TEN        10 X 2EXP-14
0424   REF   3  LAST  284   40,2141  0 7256 1          TC     SHORTMP    10SUM X 2EXP-28 IN MPAC, MPAC+1
0425   REF  63  LAST  310   40,2142  56 155 C          XCH    MPAC   +1
0426   REF   5  LAST  310   40,2143  6 0117 C          AD     CHAR
0427   REF  64  LAST  310   40,2144  54 155 1          TS     MPAC   +1
0428   REF   2  LAST  310   40,2145  0 2150 1          TC     ENDNMTST   NO OF
0429   REF  65  LAST  310   40,2146  26 154 C          ADS    MPAC       OF MUST BE 5TH CHAR
0430   REF   1              40,2147  0 2166 1          TC     DECEND
0431   REF   3  LAST  310   40,2150  50 137 1 ENDNMTST INDEX  INREL
0432   REF   4  LAST  310   40,2151  55'001 C          TS     VERBREG
0433   REF   6  LAST  309   40,2152  4 0777 1          CS     DSPCOUNT
0434   REF   4  LAST  310   40,2153  50 137 1          INDEX  INREL
0435   REF   1              40,2154  6 2216 C          AD     CRITCON
0436                        40,2155  0 0006 1          EXTEND
0437   REF   1              40,2156  1 2160 C          BZF    ENDNUM     -0, DSPCOUNT = CRITCON
0438   REF   1              40,2157  0 2213 C          TC     MORNUM     - , DSPCOUNT G/ CRITCON
0439   REF   4  LAST  310   40,2160  3 6214 C ENDNUM   CAF    THREE
0440   REF   3  LAST  310   40,2161  7 1000 1          MASK   DECBRNCH
0441   REF  78  LAST  310   40,2162  10 000 C          CCS    A
0442   REF   2  LAST  310   40,2163  0 2166 1          TC     DECEND
0443   REF   7  LAST  310   40,2164  4 0777 1 ENDALL   CS     DSPCOUNT   BLOCK NUMIN BY PLACING DSPCOUNT
0444   REF   2  LAST  310   40,2165  0 2214 1          TC     MORNUM +1  NEGATIVELY
0445   REF  15  LAST  308   40,2166  4 4712 C DECEND   CS     ONE
0446   REF   5  LAST  310   40,2167  6 0137 1          AD     INREL
0447                        40,2170  0 0006 1          EXTEND
0448   REF   1              40,2171  6 2164 C          BZMF   ENDALL     IF INREL=0,1(VBREG,NNREG), LEAVE WHOLE
0449   REF   1              40,2172  0 7052 1          TC     DMP        IF INREL=2,3,4(R1,R2,R3),CONVERT TO FRAC
A0450                                                                   MULT SUM X 2EXP-28 IN MPAC, MPAC+1 BY
0451   REF   1              40,2173   02223 C          ADRES  DECON      2EXP14/10EXP5. GIVES(SUM/10EXP5)X2EXP-14
0452   REF   5  LAST  310   40,2174  3 6214 C          CAF    THREE      IN MPAC, +1, +2.
0453   REF   4  LAST  310   40,2175  7 1000 1          MASK   DECBRNCH
0454   REF  79  LAST  310   40,2176  50 000 1          INDEX  A
0455                        40,2177  0 2177 1          TC     +0
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0456   REF   1                40,2200  0 2204 C            TC      +DECSGN
0457                          40,2201  0 0006 1            EXTEND                  - CASE
0458   REF  66  LAST  310     40,2202  4 0156 1            DCS     MPAC    +1
0459   REF  67  LAST  311     40,2203  52 156 1            DXCH    MPAC    +1
0460   REF  68  LAST  311     40,2204  56 156 C  +DECSGN   XCH     MPAC    +2
0461   REF   6  LAST  310     40,2205  50 137 1            INDEX   INREL
0462   REF   1                40,2206  55'004 C           TS      XREGLP  -2
0463   REF  69  LAST  311     40,2207  56 155 C            XCH     MPAC    +1
0464   REF   7  LAST  311     40,2210  50 137 1            INDEX   INREL
0465   REF   5  LAST  310     40,2211  55'001 C           TS      VERBREG
0466   REF   2  LAST  310     40,2212  0 2164 C            TC      ENDALL
0467   REF   8  LAST  310     40,2213  10 777 1  MORNUM    CCS     DSPCOUNT        DECREMENT DSPCOUNT
0468   REF   9  LAST  311     40,2214  54 777 1            TS      DSPCOUNT
0469   REF  24  LAST  309     40,2215  0 5112 C            TC      ENDOFJOB

0470                          40,2216   00022 1  CRITCON   OCT     22              (DEC 18)
0471                          40,2217   00020 C            OCT     20              (DEC 16)
0472                          40,2220   00012 1            OCT     12              (DEC 10)
0473                          40,2221   00005 1            OCT     5
0474                          40,2222   00000 1            OCT     0

0475                          40,2223   05174 C  DECON     2DEC    E-5 B14         2EXP14/10EXP5 = .16384 DEC
0475                          40,2224   13261 C

R0476  GETINREL GETS PROPER DATA REG REL ADDRESS FOR CURRENT C(DSPCOUNT) AND
R0477  PUTS IN INTO INREL. +0 VERBREG, 1 NOUNREG, 2 XREG, 3 YREG, 4 ZREG.

0478   REF  10  LAST  311     40,2225  50 777 C  GETINREL INDEX   DSPCOUNT
0479   REF   1                40,2226  3 2231 C           CAF     INRELTAB
0480   REF   8  LAST  311     40,2227  54 137 C           TS      INREL           (A TEMP, REG)
0481   REF  38  LAST  299     40,2230  0 0002 C           TC      Q

0482                          40,2231   00004 C  INRELTAB OCT     4               R3D5 (DSPCOUNT = 0)
0483                          40,2232   00004 C            OCT     4               R3D4          =(1)
0484                          40,2233   00004 C            OCT     4               R3D3          =(2)
0485                          40,2234   00004 C            OCT     4               R3D2          =(3)
0486                          40,2235   00004 C            OCT     4               R3D1          =(4)
0487                          40,2236   00003 1            OCT     3               R2D5          =(5)
0488                          40,2237   00003 1            OCT     3               R2D4          =(6)
0489                          40,2240   00003 1            OCT     3               R2D3          =(7)
0490                          40,2241   00003 1            OCT     3               R2D2          =(8D)
0491                          40,2242   00003 1            OCT     3               R2D1          =(9D)
0492                          40,2243   00002 C            OCT     2               R1D5          =(10D)
0493                          40,2244   00002 C            OCT     2               R1D4          =(11D)
0494                          40,2245   00002 C            OCT     2               R1D3          =(12D)
0495                          40,2246   00002 C            OCT     2               R1D2          =(13D)
0496                          40,2247   00002 C            OCT     2               R1D1          =(14D)
0497   REF   1                40,2250  0 5642 1            TC      CCSHOLE         NO DSPCOUNT NUMBER = 15D
0498                          40,2251   00001 C            OCT     1               ND2           =(16D)
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0499                          40,2252   00001 0          OCT   1          ND1          =(17D)
0500                          40,2253   00000 1          OCT   0          VD2          =(18D)
0501                          40,2254   00000 1          OCT   0          VD1          =(19D)

0502  REF  34  LAST  310     40,2255   3 4714 1  VERB    CAF   ZERO
0503  REF   6  LAST  311     40,2256   55*001 0          TS    VERBREG
0504  REF   2  LAST  187     40,2257   3 4374 0          CAF   VD1
0505  REF  11  LAST  311     40,2260   54 777 1  NVCOM   TS    DSPCOUNT
0506  REF   1               40,2261   0 2502 1          TC    2BLANK
0507  REF  16  LAST  310     40,2262   3 4712 1          CAF   ONE
0508  REF   5  LAST  310     40,2263   55*000 1          TS    DECBRNCH    SET FOR DEC V/N CODE
0509  REF  35  LAST  312     40,2264   3 4714 1          CAF   ZERO
0510  REF   2  LAST  187     40,2265   55*013 0          TS    REQRET      SET FOR ENTPASO
0511  REF   1               40,2266   3 4233 1          CAF   ENDINST     IF DSPALARM OCCURS BEFORE FIRST ENTPASO
0512  REF   1               40,2267   54 136 1          TS    ENTRET      OR NVSUB, ENTRET MUST ALREADY BE SET
A0513                                                                     TO TC ENDOFJOB
0514  REF  25  LAST  311     40,2270   0 5112 0          TC    ENDOFJOB
0515  REF  36  LAST  312     40,2271   3 4714 1  NOUN    CAF   ZERO
0516  REF   7  LAST  263     40,2272   55*002 0          TS    NOUNREG
0517  REF   1               40,2273   3 4375 1          CAF   ND1         ND1, OCT 21 (DEC 17)
0518  REF   1               40,2274   0 2260 1          TC    NVCOM

0519  REF   1               40,2275   0 2347 0  NEGSGN  TC    SIGNTEST
0520  REF   1               40,2276   0 2334 1          TC    -ON
0521  REF   7  LAST  295     40,2277   3 4711 1          CAF   TWO
0522  REF   9  LAST  311     40,2300   50 137 1  BOTHSGN INDEX INREL       SET DEC COMP BIT TO 1 (IN DECBRNCH)
0523  REF  26  LAST  252     40,2301   6 4704 0          AD    BIT7        BIT 5 FOR R1,  BIT 4 FOR R2,
0524  REF   6  LAST  312     40,2302   27*000 1          ADS   DECBRNCH    BIT 3 FOR R3.
0525  REF   4  LAST  309     40,2303   11*015 0  FIXCLPAS CCS   CLPASS      IF CLPASS IS + OR +0, MAKE IT +0.
0526  REF  37  LAST  312     40,2304   3 4714 1          CAF   ZERO
0527  REF   5  LAST  312     40,2305   55*015 0          TS    CLPASS
0528                          40,2306   0 2307 1          TC    +1
0529  REF  26  LAST  312     40,2307   0 5112 0          TC    ENDOFJOB

0530  REF   2  LAST  312     40,2310   0 2347 0  POSGN   TC    SIGNTEST
0531  REF   1               40,2311   0 2314 0          TC    +ON
0532  REF  17  LAST  312     40,2312   3 4712 1          CAF   ONE
0533  REF   1               40,2313   0 2300 0          TC    BOTHSGN

0534  REF  39  LAST  311     40,2314   22 002 0  +ON     LXCH  Q
0535  REF   2  LAST  309     40,2315   0 2225 0          TC    GETINREL
0536  REF  10  LAST  312     40,2316   50 137 1          INDEX INREL
0537  REF   1               40,2317   3 2342 0          CAF   SGNTAB  -2
0538  REF   1               40,2320   54 123 0          TS    SGNOFF
0539  REF  18  LAST  312     40,2321   6 4712 1          AD    ONE
0540  REF   1               40,2322   54 122 1          TS    SGNON
0541  REF  38  LAST  312     40,2323   3 4714 1  SGNCOM  CAF   ZERO
0542  REF   2  LAST  309     40,2324   54 124 1          TS    CODE
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0543   REF   2  LAST  312   40,2325  56 123 1          XCH   SGNOFF
0544   REF   1              40,2326  0 3307 0          TC    11DSPIN
0545   REF  14  LAST  259   40,2327  3 4700 1          CAF   BIT11
0546   REF   3  LAST  312   40,2330  54 124 1          TS    CODE
0547   REF   2  LAST  312   40,2331  56 122 0          XCH   SGNON
0548   REF   2  LAST  313   40,2332  0 3307 0          TC    11DSPIN
0549   REF  25  LAST  299   40,2333  0 0001 0          TC    L
0550   REF  40  LAST  312   40,2334  22 002 0  -CN     LXCH  Q
0551   REF   3  LAST  312   40,2335  0 2225 0          TC    GETINREL
0552   REF  11  LAST  312   40,2336  50 137 1          INDEX INREL
0553   REF   2  LAST  312   40,2337  3 2342 0          CAF   SGNTAB  -2
0554   REF   3  LAST  313   40,2340  54 122 1          TS    SGNON
0555   REF  19  LAST  312   40,2341  6 4712 1          AD    ONE
0556   REF   3  LAST  313   40,2342  54 123 0          TS    SGNOFF
0557   REF   1              40,2343  0 2323 1          TC    SGNCOM

0558                        40,2344   00005 1  SGNTAB  OCT   5              -R1
0559                        40,2345   00003 1          OCT   3              -R2
0560                        40,2346   00000 1          OCT   0              -R3

0561   REF  41  LAST  313   40,2347  22 002 0  SIGNTEST LXCH  Q              ALLOWS +,- ONLY WHEN DSPCOUNT=R1D1,
0562   REF   6  LAST  310   40,2350  3 6214 0          CAF   THREE          R2D1, OR R3D1. ALLOWS ONLY FIRST OF
0563   REF   7  LAST  312   40,2351  7 1000 1          MASK  DECBRNCH       CONSECUTIVE +/- CHARACTERS.
0564   REF  80  LAST  310   40,2352  10 000 0          CCS   A              IF LOW2 BITS OF DECBRNCH NOT= 0, SIGN
0565   REF  27  LAST  312   40,2353  0 5112 0          TC    ENDOFJOB       FOR THIS WORD ALREADY IN. REJECT.
0566   REF   2  LAST  226   40,2354  4 4333 1          CS    R1D1
0567   REF   1              40,2355  0 2363 0          TC    SGNTST1
0568   REF   1              40,2356  4 4334 0          CS    R2D1
0569   REF   2  LAST  313   40,2357  0 2363 0          TC    SGNTST1
0570   REF   1              40,2360  4 4335 1          CS    R3D1
0571   REF   3  LAST  313   40,2361  0 2363 0          TC    SGNTST1
0572   REF  28  LAST  313   40,2362  0 5112 0          TC    ENDOFJOB       NO MATCH FOUND. SIGN ILLEGAL
0573   REF  12  LAST  312   40,2363  6 0777 0  SGNTST1 AD    DSPCOUNT
0574                        40,2364  0 0006 1          EXTEND
0575                        40,2365  1 2367 0          BZF   +2             MATCH FOUND
0576   REF  42  LAST  313   40,2366  0 0002 0          TC    Q
0577   REF  26  LAST  313   40,2367  0 0001 0          TC    L              SIGN LEGAL

R0578  CLEAR BLANKS WHICH R1, R2, R3 IS CURRENT OR LAST TO BE DISPLAYED(PERTINE
R0579  NT XREG,YREG,ZREG IS CLEARED). SUCCESSIVE CLEARS TAKE CARE OF EACH RX
R0580  L/ RC UNTIL R1 IS DONE. THEN NO FURTHER ACTION

R0581  THE SINGLE COMPONENT LOAD VERBS ALLOW ONLY THE SINGLE RC THAT IS
R0582  APPROPRIATE TO BE CLEARED.

R0583  CLPASS   +0  PASSO, CAN BE BACKED UP
R0584           +NZ  HIPASS, CAN BE BACKED UP
R0585           -NZ  PASSO, CANNOT BE BACKED UP
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0586   REF  13  LAST  313   40,2370  10 777 1  CLEAR   CCS    DSPCOUNT
0587   REF  20  LAST  313   40,2371  6 4712 1           AD     ONE
0588                        40,2372  0 2374 0           TC     +2
0589   REF  21  LAST  314   40,2373  6 4712 1           AD     ONE
0590   REF  81  LAST  313   40,2374  50 000 1           INDEX  A        DO NOT CHANGE DSPCOUNT BECAUSE MAY LATER
0591   REF   2  LAST  311   40,2375  3 2231 0           CAF    INRELTAB FAIL LEGALTST.
0592   REF  12  LAST  313   40,2376  54 137 0           TS     INREL    MUST SET INREL, EVEN FOR HIPASS.
0593   REF   6  LAST  312   40,2377  11'015 0           CCS    CLPASS
0594   REF   1              40,2400  0 2406 1           TC     CLPASHI  +
0595                        40,2401  0 2403 1           TC     +2       +0    IF CLPASS IS +0 OR -, IT IS PASSO
0596                        40,2402  0 2403 1           TC     +1       -
0597   REF  13  LAST  314   40,2403  3 0137 1           CA     INREL
0598   REF   1              40,2404  0 2430 1           TC     LEGALTST
0599   REF   1              40,2405  0 2423 0           TC     CLEAR1
0600   REF  14  LAST  314   40,2406  10 137 0  CLPASHI  CCS    INREL
0601   REF  15  LAST  314   40,2407  54 137 0           TS     INREL
0602   REF   2  LAST  314   40,2410  0 2430 1           TC     LEGALTST
0603   REF   1              40,2411  3 2500 0           CAF    DOUBLK +2       +3 TO - NUMBER. BACKS DATA REQUESTS.
0604   REF   3  LAST  312   40,2412  27'013 0           ADS    REQRET
0605   REF  16  LAST  314   40,2413  3 0137 1           CA     INREL
0606   REF   1              40,2414  54 125 0           TS     MIXTEMP  TEMP STORAGE FOR INREL
0607                        40,2415  0 0006 1           EXTEND
0608   REF   7  LAST  312   40,2416  27'001 0           DIM    VERBREG  DECREMENT VERB AND RE-DISPLAY
0609   REF  38  LAST  299   40,2417  0 4555 0           TC     BANKCALL
0610   REF   1              40,2420  62337 1            CADR   UPDATVB
0611   REF   2  LAST  314   40,2421  3 0125 1           CA     MIXTEMP
0612   REF  17  LAST  314   40,2422  54 137 0           TS     INREL    RESTORE INREL
0613   REF   1              40,2423  0 2426 0  CLEAR1   TC     CLR5
0614   REF   7  LAST  314   40,2424  25'015 1           INCR   CLPASS   ONLY IF CLPASS IS + OR +0,
0615   REF  29  LAST  313   40,2425  0 5112 0           TC     ENDOFJOB SET FOR HIGHER PASS.
0616   REF  43  LAST  313   40,2426  22 002 0  CLR5     LXCH   Q        USES 5BLANK  BUT AVOIDS ITS TC GETINREL
0617   REF   1              40,2427  0 2441 1           TC     5BLANK +2
0618   REF   2  LAST  228   40,2430  6 7715 0  LEGALTST AD     NEG2
0619   REF  82  LAST  314   40,2431  10 000 0           CCS    A
0620   REF  44  LAST  314   40,2432  0 0002 0           TC     Q        LEGAL  INREL G/ 2
0621   REF   2  LAST  311   40,2433  0 5642 1           TC     CCSHOLE
0622   REF  30  LAST  314   40,2434  0 5112 0           TC     ENDOFJOB ILLEGAL   INREL= 0,1
0623   REF  45  LAST  314   40,2435  0 0002 0           TC     Q        LEGAL    INREL = 2

R0624  5BLANK BLANKS 5 CHAR DISPLAY WORD IN R1, R2, OR R3. IT ALSO ZEROES XREG,
R0625  YREG, OR ZREG.PLACE ANY + DSPCOUNT NUMBER FOR PERTINENT RC INTO DSPCOUNT
R0626  DSPCOUNT IS LEFT SET TO LEFT MOST DSP NUMB FOR RC JUST BLANKED.

0627   REF  14  LAST  314   40,2436  54 777 1           TS     DSPCOUNT NEEDED FOR BLANKSUB
0628   REF  46  LAST  314   40,2437  22 002 0  5BLANK   LXCH   Q
0629   REF   4  LAST  313   40,2440  0 2225 0           TC     GETINREL
0630   REF  39  LAST  312   40,2441  3 4714 1           CAF    ZERO
0631   REF  18  LAST  314   40,2442  50 137 1           INDEX  INREL
0632   REF   8  LAST  314   40,2443  55'001 0           TS     VERBREG  ZERO X, Y, Z REG.
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0633   REF  19  LAST  314   40,2444  5C 137 1          INDEX  INREL
0634   REF   2  LAST  311   40,2445  55'004 C          TS     XPEGLP  -2
0635   REF   4  LAST  313   40,2446  54 124 1          TS     CODE
0636   REF  2C  LAST  315   40,2447  5C 137 1          INDEX  INREL          ZERO PERTINENT DEC COMP BIT.
0637   REF  27  LAST  312   40,2450  4 4704 1          CS     BIT7           PROTECT OTHERS
0638   REF   8  LAST  313   40,2451  7 1000 1          MASK   DECBRNCH
0639   REF   1                40,2452  7 2501 C          MASK   BRNCHCON       ZERO LOW 2 BITS.
0640   REF   9  LAST  315   40,2453  55'000 1          TS     DECBRNCH
0641   REF  21  LAST  315   40,2454  5C 137 1          INDEX  INREL
0642   REF   1                40,2455  3 2471 1          CAF    SINBLANK -2    BLANK ISOLATED CHAR SEPARATELY
0643   REF   2  LAST  309   40,2456  54 143 C          TS     COUNT
0644   REF   2  LAST  309   40,2457  0 3225 1          TC     DSPIN
0645   REF  22  LAST  315   40,2460  5C 137 1  5BLANK1  INDEX  INREL
0646   REF   2  LAST  314   40,2461  3 2474 1          CAF    DOUBLK  -2
0647   REF  15  LAST  314   40,2462  54 777 1          TS     DSPCOUNT
0648   REF   2  LAST  312   40,2463  0 2502 1          TC     2BLANK
0649   REF   8  LAST  312   40,2464  4 4711 C          CS     TWO
0650   REF  16  LAST  315   40,2465  26 777 1          ADS    DSPCOUNT
0651   REF   3  LAST  315   40,2466  0 2502 1          TC     2BLANK
0652   REF  23  LAST  315   40,2467  5C 137 1          INDEX  INREL
0653   REF   3  LAST  313   40,2470  3 4331 1          CAF    RIDI    -2
0654   REF  17  LAST  315   40,2471  54 777 1          TS     DSPCOUNT       SET DSPCOUNT TO LEFT MOST DSP NUMBER
0655   REF  27  LAST  313   40,2472  0 0001 C          TC     L              OF REG. JUST BLANKED
0656                        40,2473  00016 C  SINBLANK OCT    16             DEC 14
0657                        40,2474  00005 1          OCT    5
0658                        40,2475  00004 C          OCT    4
0659                        40,2476  00015 C  DOUBLK   OCT    15             DEC 13
0660                        40,2477  00011 1          OCT    11             DEC 9
0661                        40,2500  00003 1          OCT    3

0662                        40,2501  77774 C  BRNCHCON OCT    77774

R0663  2BLANK BLANKS TWO CHAR. PLACE DSP NUMBER OF LEFT CHAR  OF THE PAIR INTO
R0664  DSPCOUNT. THIS NUMBER IS LEFT IN DSPCOUNT

0665   REF  18  LAST  315   40,2502  3 0777 C  2BLANK   CA     DSPCOUNT
0666   REF   4  LAST  26C   40,2503  54 021 C          TS     SR
0667   REF   1                40,2504  4 2515 C          CS     BLANKCON
0668                        40,2505  0 0004 C          INHINT
0669   REF   5  LAST  315   40,2506  50 021 1          INDEX  SR
0670   REF  23  LAST  186   40,2507  57'023 1          XCH    DSPTAB
0671                        40,2510  0 0006 1          EXTEND
0672                        40,2511  6 2513 1          BZMF   +2             IF OLD CONTENTS -, NOUT OK
0673   REF   6  LAST  187   40,2512  25'016 1          INCR   NOUT           IF OLD CONTENTS +, +1 TO NOUT
0674                        40,2513  0 0003 1          RELINT                IF -,NOUT OK
0675   REF  47  LAST  314   40,2514  0 0002 C          TC     Q
0676                        40,2515  04000 C  BLANKCON OCT    4000
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R0677   ENTER PASS 0 IS THE EXECUTE FUNCTION. HIGHER ORDER ENTERS ARE TO LOAD
R0678   DATA. THE SIGN OF REQRET DETERMINES THE PASS, + FOR PASS 0,- FOR HIGHER
R0679   PASSES.


R0680   MACHINE CADR TO BE SPECIFIED (MCTBS) NOUNS DESIRE AN ECADR TO BE LOADED
R0681   WHEN USED WITH LOAD VERBS, MONITOR VERBS, OR DISPLAY VERBS (EXCEPT
R0682   VERB = FIXED MEMORY DISPLAY, WHICH REQUIRES AN FCADR).


 0683                           41,2000                          BANK   41
 0683C1 REF    1                41,2000                          SETLOC PINBALL2
 0683C2                         41,2000                          BANK

 06835  REF    1                                                COUNT  41/PIN

 0684   REF    1                41,2000  0 3534 C  NVSUBB   TC     NVSUB1      STANDARD LEAD INS. DONT MOVE.
 0685   REF    1                41,2001  0 2771 1  LOADLV1  TC     LOADLV
A0686                                                                          END OF STANDARD LEAD INS.


 0687   REF   40  LAST  314     41,2002  3 4714 1  ENTER     CAF    ZERO
 0688   REF    8  LAST  314     41,2003  55'015 C            TS     CLPASS
 0689   REF    2  LAST  312     41,2004  3 4233 1            CAF    ENDINST
 0690   REF    2  LAST  312     41,2005  54 136 1            TS     ENTRET
 0691   REF    4  LAST  314     41,2006  11'013 C            CCS    REQRET
 0692   REF    1               41,2007  0 2035 C            TC     ENTPASO     IF +, PASS 0
 0693   REF    2  LAST  316     41,2010  0 2035 C            TC     ENTPASO     IF +, PASS 0
 0694                           41,2011  0 2012 C            TC     +1          IF -, NOT PASS 0
 0695   REF    1               41,2012  3 2033 C  ENTPASHI  CAF    MMADREF
 0696   REF    5  LAST  316     41,2013  6 1013 1            AD     REQRET      IF L/ 2 CHAR IN FOR MM CODE, ALARM
 0697                           41,2014  0 0006 1            EXTEND             AND RECYCLE(DECIDE AT MMCHANG+1).
 0698   REF    1               41,2015  1 2027 1            BZF    ACCEPTWD
 0699   REF    7  LAST  313     41,2016  3 6214 0            CAF    THREE       IF DEC, ALARM IF L/ 5 CHAR IN FOR DATA,
 0700   REF   1C  LAST  315     41,2017  7 1000 1            MASK   DECBRNCH    BUT LEAVE REQRET - AND FLASH ON, SO
 0701   REF   83  LAST  314     41,2020  10 000 0            CCS    A           OPERATOR CAN SUPPLY MISSING NUMERICAL
 0702                           41,2021  0 2023 1            TC     +2          CHARACTERS AND CONTINUE.
 0703   REF    2  LAST  316     41,2022  0 2027 0            TC     ACCEPTWD    OCTAL. ANY NUMBER OF CHAR OK.
 0704   REF   19  LAST  315     41,2023  10 777 1            CCS    DSPCOUNT
 0705   REF    1               41,2024  0 2350 0            TC     GODSPALM    LESS THAN 5 CHAR DEC(DSPCOUNT IS +)
 0706   REF    2  LAST  316     41,2025  0 2350 0            TC     GODSPALM    LESS THAN 5 CHAR DEC(DSPCOUNT IS +)
 0707                           41,2026  0 2027 0            TC     +1          5 CHAR IN (DSPCOUNT IS -)
 0708   REF    6  LAST  316     41,2027  4 1013 0  ACCEPTWD  CS     REQRET      5 CHAR IN (DSPCOUNT IS -)
 0709   REF    7  LAST  316     41,2030  55'013 0            TS     REQRET      SET REQRET +.
 0710   REF    2  LAST  237     41,2031  0 4447 1            TC     FLASHOFF
 0711   REF    8  LAST  316     41,2032  0 1013 1            TC     REQRET

 0712   REF    3  LAST  316       0136           ENTEXIT  =      ENTRET

 0713   REF    1               41,2033   03421 C  MMADREF  ADRES  MMCHANG +1    ASSUMES TC REQMM AT MMCHANG.
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0714                                41,2034   00034 0  LOWVERB  DEC     28              LOWER VERB THAT AVOIDS NOUN TEST.

0715  REF  41  LAST  316   41,2035  3 4714 1  ENTPASO  CAF     ZERO            NOUN VERB SUB ENTERS HERE
0716  REF  11  LAST  316   41,2036  55*000 1           TS      DECBRNCH
0717  REF   3  LAST  312   41,2037  4 4374 1           CS      VD1             BLOCK FURTHER NUM CHAR, SO THAT STRAY
0718  REF  20  LAST  316   41,2040  54 777 1           TS      DSPCOUNT        CHAR DO NOT GET INTO VERB OR NOUN LTS.
0719  REF   9  LAST  314   41,2041  4 1001 0  TESTVB   CS      VERBREG         IF VERB IS G/E LOWVB, SKIP NOUN TEST.
0720  REF   1             41,2042  55*041 1           TS      VERBSAVE        SAVE VERB FOR POSSIBLE RECYCLE.
0721  REF   1             41,2043  6 2034 1           AD      LOWVERB         LOWVERB - VB
0722                      41,2044  0 0006 1           EXTEND
0723  REF   1             41,2045  6 2133 1           BZMF    VERBFAN         VERB G/E LOWVERB
0724                      41,2046  0 0006 1  TESTNN   EXTEND                  VERB L/ LOWVERB
0725  REF   1             41,2047  3 2114 1           DCA     LODNNLOC        SWITCH BANKS TO NOUN TABLE READING
0726  REF   3  LAST  264   41,2050  52 006 0           DXCH    Z               ROUTINE.
0727  REF   3  LAST  263   41,2051  50 140 1           INDEX   MIXBR
0728                      41,2052  0 2052 1           TC      +0
0729                      41,2053  0 2055 0           TC      +2              NORMAL
0730  REF   1             41,2054  0 2221 1           TC      MIXNOUN         MIXED
0731  REF   3  LAST  263   41,2055  10 146 0           CCS     NNADTEM         NORMAL
0732  REF   2  LAST  317   41,2056  0 2131 0           TC      VERBFAN -2          NORMAL IF +
0733  REF   3  LAST  316   41,2057  0 2350 0           TC      GODSPALM        NOT IN USE   IF +0
0734  REF   1             41,2060  0 2064 1           TC      REQADD          SPECIFY MACHINE CADR IF -
0735  REF   1             41,2061  25*017 0           INCR    NOUNCADR        AUGMENT MACHINE CADR IF -0
0736  REF   1             41,2062  0 4325 1           TC      SETNADD         ECADR FROM NOUNCADR. SETS EB, NOUNADD.
0737  REF   1             41,2063  0 2120 0           TC      INTMCTBS +2
0738  REF  21  LAST  184   41,2064  3 4674 0  REQADD   CAF     BIT15           SET CLPASS FOR PASSO ONLY
0739  REF   9  LAST  316   41,2065  55*015 0           TS      CLPASS
0740  REF   3  LAST  316   41,2066  4 4233 0           CS      ENDINST         TEST IF REACHED HERE FROM INTERNAL OR
0741  REF   1             41,2067  6 0136 0           AD      ENTEXIT                     FROM EXTERNAL
0742                      41,2070  0 0006 1           EXTEND
0743                      41,2071  1 2073 0           BZF     +2              EXTERNAL MACH CADR TO BE SPECIFIED
0744  REF   2  LAST  317   41,2072  0 2116 0           TC      INTMCTBS
0745  REF   1             41,2073  0 2306 0           TC      REQDATZ         EXTERNAL MACH CADR TO BE SPECIFIED
0746  REF  12  LAST  317   41,2074  11*000 1           CCS     DECBRNCH        ALARM AND RECYCLE IF DECIMAL USED
0747  REF   1             41,2075  0 4161 0           TC      ALMCYCLE        FOR MCTBS.
0748  REF   4  LAST  317   41,2076  4 4374 1           CS      VD1             OCTAL USED  OK
0749  REF  21  LAST  317   41,2077  54 777 1           TS      DSPCOUNT        BLOCK NUM CHAR IN
0750  REF   3  LAST  308   41,2100  11*042 1           CCS     CADRSTOR
0751                      41,2101  0 2104 0           TC      +3              EXTERNAL MCTBS DISPLAY WILL LEAVE FLASH
0752  REF   1             41,2102  0 2105 1           TC      USEADD          ON IF ENDIDLE NOT = +0.
0753                      41,2103  0 2104 0           TC      +1
0754  REF   1             41,2104  0 4443 0           TC      FLASHON
0755  REF   1             41,2105  57*005 0  USEADD   XCH     ZREG
0756  REF   1             41,2106  0 4317 0           TC      SETNCADR        ECADR INTO NOUNCADR. SET EB, NOUNADD.
0757                      41,2107  0 0006 1           EXTEND
0758  REF   2  LAST  317   41,2110  3 2114 1           DCA     LODNNLOC        SWITCH BANKS TO NOUN TABLE READING
0759  REF   4  LAST  317   41,2111  52 006 0           DXCH    Z               ROUTINE.
0760  REF   3  LAST  317   41,2112  0 2133 1           TC      VERBFAN

0761  REF  22  LAST  317        0777                  EBANK=  DSPCOUNT
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0762   REF   1                  41,2113   02062 1  LODNNLOC 2CADR  LODNNTAB
0762   REF   1                  41,2114   64101 0

0763                            41,2115   77772 0  NEG5     OCT    77772

0764   REF  70  LAST  311       41,2116  3 0156 0  INTMCTBS CA     MPAC    +2     INTERNAL MACH CADR TO BE SPECIFIED.
0765   REF   2  LAST  317       41,2117  0 4317 0           TC     SETNCADR       ECADR INTO NOUNCADR. SET EB, NOUNADD.
0766   REF   5  LAST  226       41,2120  4 4715 1           CS     FIVE           NVSUB CALL LEFT CADR IN MPAC+2 FOR MACH
0767   REF  10  LAST  317       41,2121  6 1001 1           AD     VERBREG        CADR TO BE SPECIFIED.
0768                            41,2122  0 0006 1           EXTEND
0769   REF   4  LAST  317       41,2123  1 2133 0           BZF    VERBFAN        DONT DISPLAY CADR IF VB = 05.
0770   REF   2  LAST  313       41,2124  3 4335 0           CAF    R3D1           VB NOT = 05. DISPLAY CADR.
0771   REF  23  LAST  317       41,2125  54 777 1           TS     DSPCOUNT
0772   REF   2  LAST  317       41,2126  3 1017 0           CA     NOUNCADR
0773   REF   1                  41,2127  0 3353 1           TC     DSPOCTWD
0774   REF   5  LAST  318       41,2130  0 2133 1           TC     VERBFAN

0775   REF  22  LAST  314       41,2131  6 4712 1           AD     ONE
0776   REF   3  LAST  318       41,2132  0 4317 0           TC     SETNCADR       ECADR INTO NOUNCADR. SETS EB, NOUNADD.
0777   REF   1                  41,2133  4 2145 1  VERBFAN  CS     LST2CON
0778   REF  11  LAST  318       41,2134  6 1001 1           AD     VERBREG        VERB-LST2CON
0779   REF  64  LAST  316       41,2135  10 000 0           CCS    A
0780   REF  23  LAST  318       41,2136  6 4712 1           AD     ONE-           VERB G/ LST2CON
0781                            41,2137  0 2141 1           TC     +2
0782   REF   1                  41,2140  0 2146 0           TC     VBFANDIR       VERB L/ LST2CON
0783   REF  71  LAST  318       41,2141  54 154 0           TS     MPAC
0784   REF   4  LAST  197       41,2142  0 4473 0           TC     RELDSP         RELEASE DISPLAY SYST
0785   REF  16  LAST  309       41,2143  0 4574 0           TC     POSTJUMP       GO TO GOEXTVB WITH VB-40 IN MPAC.
0786   REF   1                  41,2144   66000 1           CADR   GOEXTVB
0788                            41,2145   00050 1  LST2CON  DEC    40             FIRST LIST2 VERB (EXTENDED VERB)

0790   REF  12  LAST  318       41,2146  51'001 1  VBFANDIR INDEX  VERBREG
0791   REF   1                  41,2147  3 2151 0           CAF    VERBTAB
0792   REF   1                  41,2150  0 4577 0           TC     BANKJUMP

0793   REF   4  LAST  317       41,2151   62350 0  VERBTAB  CADR   GODSPALM       V800 ILLEGAL
0794   REF   1                  41,2152   62364 1           CADR   DSPA           V801 DISPLAY OCT COMP 1 (R1)
0795   REF   1                  41,2153   62372 0           CADR   DSPB           V802 DISPLAY OCT COMP 2 (R1)
0796   REF   1                  41,2154   62377 0           CADR   DSPC           V803 DISPLAY OCT COMP 3 (R1)
0797   REF   1                  41,2155   62357 1           CADR   DSPAB          V804 DISPLAY OCT COMP 1,2 (R1,R2)
0798   REF   1                  41,2156   62352 1           CADR   DSPABC         V805 DISPLAY OCT COMP 1,2,3 (R1,R2,R3)
0799   REF   1                  41,2157   62520 1           CADR   DECDSP         V806 DECIMAL DISPLAY
0800   REF   1                  41,2160   60675 0           CADR   DSPDPDEC       V807 DP DECIMAL DISPLAY (R1,R2)
0801   REF   5  LAST  318       41,2161   62350 0           CADR   GODSPALM       V808 SPARE
0802   REF   6  LAST  318       41,2162   62350 0           CADR   GODSPALM       V809 SPARE
0803   REF   1                  41,2163   61323 1           CADR   DSPALARM       V810 SPARE
0804   REF   1                  41,2164   63220 1           CADR   MONITOR        V811 MONITOR OCT COMP 1 (R1)
0805   REF   2  LAST  318       41,2165   63220 1           CADR   MONITOR        V812 MONITOR OCT COMP 2 (R1)
0806   REF   3  LAST  318       41,2166   63220 1           CADR   MONITOR        V813 MONITOR OCT COMP 3 (R1)
0807   REF   4  LAST  318       41,2167   63220 1           CADR   MONITOR        V814 MONITOR OCT COMP 1,2 (R1,R2)
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 0808   REF   5  LAST  318   41,2170   63220 1          CADR   MONITOR    V815 MONITOR OCT COMP 1,2,3 (R1,R2,R3)
 0809   REF   6  LAST  319   41,2171   63220 1          CADR   MONITOR    V816 MONITOR DECIMAL
 0810   REF   7  LAST  319   41,2172   63220 1          CADR   MONITOR    V817 MONITOR DP DEC  (R1,R2)
 0811   REF   7  LAST  318   41,2173   62350 C          CADR   GODSPALM   V818 SPARE
 0812   REF   8  LAST  319   41,2174   62350 C          CADR   GODSPALM   V819 SPARE
 0813   REF   9  LAST  319   41,2175   62350 C          CADR   GODSPALM   V820 SPARE
 0814   REF   1              41,2176   62726 C          CADR   ALOAD      V821 LOAD COMP 1 (R1)
 0815   REF   1              41,2177   62737 C          CADR   BLOAD      V822 LOAD COMP 2 (R2)
 0816   REF   1              41,2200   62754 C          CADR   CLOAD      V823 LOAD COMP 3 (R3)
 0817   REF   1              41,2201   62677 C          CADR   ABLOAD     V824 LOAD COMP 1,2 (R1,R2)
 0818   REF   1              41,2202   62612 C          CADR   ABCLOAD    V825 LOAD COMP 1,2,3 (R1,R2,R3)
 0819   REF  10  LAST  319   41,2203   62350 C          CADR   GODSPALM   V826 SPARE
 0820   REF   1              41,2204   63343 C          CADR   DSPFMEM    V827 FIXED MEMORY DISPLAY
A0821                                                                    THE FOLLOWING VERBS MAKE NO NOUN TEST
 0822   REF  11  LAST  319   41,2205   62350 C          CADR   GODSPALM   V828 SPARE
 0823   REF  12  LAST  319   41,2206   62350 C          CADR   GODSPALM   V829 SPARE
 0824   REF   1              41,2207   63456 C REQEXLOC CADR   VBRQEXEC   V830 REQUEST EXECUTIVE
 0825   REF   1              41,2210   63502 C          CADR   VBRQWAIT   V831 REQUEST WAITLIST
 0826   REF   1              41,2211   61360 C          CADR   VBRESEQ    V832 RESEQUENCE
 0827   REF   1              41,2212   61343 1          CADR   VBPROC     V833 PROCEED WITHOUT DATA
 0828   REF   1              41,2213   61351 1          CADR   VBTERM     V834 TERMINATE CURRENT TEST OR LOAD REQ
 0829   REF   1              41,2214   63603 1          CADR   VBTSTLTS   V835 TEST LIGHTS
 0830   REF   1              41,2215   12347 1          CADR   SLAP1      V836 FRESH START
 0831   REF   2  LAST  316   41,2216   63420 1          CADR   MMCHANG    V837 CHANGE MAJOR MODE
 0832   REF  13  LAST  319   41,2217   62350 C          CADR   GODSPALM   V838 SPARE
 0833   REF  14  LAST  319   41,2220   62350 C          CADR   GODSPALM   V839 SPARE
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R0834 THE LIST2 VERBFAN IS LOCATED IN THE EXTENDED VERB BANK.

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P0835   NNADTAB CONTAINS A RELATIVE ADDRESS, IDADDREL(IN LOW 10 BITS), REFERRING
R0836   TO WHERE 3 CONSECUTIVE ADDRESSES ARE STORED (IN IDADDTAB).
R0837   MIXNOUN GETS DATA AND STORES IN MIXTEMP,+1,+2. IT SETS NOUNADD FOR
R0838    MIXTEMP.

 0839   REF   4  LAST  317   41,2221  10 146 C  MIXNOUN  CCS     NNADTEM
 0840                        41,2222  0 2226 C            TC      +4              +  IN USE
 0841   REF  15  LAST  319   41,2223  0 2350 C            TC      GODSPALM        +0  NOT IN USE
 0842                        41,2224  0 2226 C            TC      +2              -  IN USE
 0843                        41,2225  0 2226 C            TC      +1              -0  IN USE
 0844   REF  11  LAST  221   41,2226  4 6211 1            CS      SIX
 0845   REF  13  LAST  318   41,2227  6 1001 1            AD      VERBREG
 0846                        41,2230  0 0006 1            EXTEND
 0847                        41,2231  6 2233 1            BZMF    +2              VERB L/E 6
 0848   REF   6  LAST  318   41,2232  0 2133 1            TC      VERBFAN         AVOID MIXNOUN SWAP IF VB NOT = DISPLAY
 0849   REF   9  LAST  315   41,2233  3 4711 1            CAF     TWO
 0850   REF   1              41,2234  54 117 1  MIXNN1   TS      DECOUNT
 0851   REF   1              41,2235  6 2260 1            AD      MIXAD
 0852   REF   1              41,2236  54 145 C            TS      NOUNADD         SET NOUNADD TO MIXTEMP + K
 0853   REF   2  LAST  320   41,2237  50 117 0            INDEX   DECOUNT         GET IDADDTAB ENTRY FOR COMPONENT K
 0854   REF   2  LAST  263   41,2240  3 0150 C            CA      IDADITEM        OF NOUN.
 0855   REF   1              41,2241  54 122 1            TS      NOUNTEM
A0856                                                                            TEST FOR DP(FOR OCT DISPLAY). IF SO, GET
A0857                                                                             MINOR PART ONLY.
 0858   REF   1              41,2242  0 3027 1            TC      SFRUTMIX        GET SF ROUT NUMBER IN A
 0859   REF   1              41,2243  0 2261 C            TC      DPTEST
 0860   REF   1              41,2244  0 2246 C            TC      MIXNN2          NO DP
 0861   REF   2  LAST  320   41,2245  24 122 0            INCR    NOUNTEM         DP  GET MINOR PART
 0862   REF   3  LAST  320   41,2246  3 0122 0  MIXNN2   CA      NOUNTEM
 0863   REF   3  LAST  130   41,2247  7 4372 1            MASK    LOW11           ESUBK (NO DP)  OR (ESUBK)+1    FOR DP
 0864   REF   1              41,2250  0 4327 C            TC      SETEBANK        SET EBANK, LEAVE EADRES IN A.
 0865   REF  65  LAST  318   41,2251  50 000 1            INDEX   A               PICK UP C(ESUBK)  NOT DP
 0866                        41,2252  3 0000 1            CA      0               OR C((ESUBK)+1)  FOR DP MINOR PART
 0867   REF   2  LAST  320   41,2253  50 145 1            INDEX   NOUNADD
 0868                        41,2254  56 000 1            XCH     0               STORE IN MIXTEM + K
 0869   REF   3  LAST  320   41,2255  10 117 1            CCS     DECOUNT
 0870   REF   1              41,2256  0 2234 0            TC      MIXNN1
 0871   REF   7  LAST  320   41,2257  0 2133 1            TC      VERBFAN

 0872   REF   3  LAST  314   41,2260  0 0125 1  MIXAD    TC      MIXTEMP


R0873   DPTEST  ENTER WITH SF ROUT NUMBER IN A.
R0874           RETURNS TO L+1 IF NO DP.
R0875           RETURNS TO L+2 IF DP.

 0876   REF  66  LAST  320   41,2261  50 000 1  DPTEST   INDEX   A
 0877                        41,2262  1 2263 C            TCF     +1
 0878   REF  48  LAST  315   41,2263  0 0002 C            TC      Q               OCTAL ONLY  NO DP
 0879   REF  49  LAST  320   41,2264  0 0002 C            TC      Q               FRACT NO DP
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0880   REF  50  LAST  320   41,2265  0 0002 0          TC     Q          DEG  NO DP
0881   REF  51  LAST  321   41,2266  0 0002 0          TC     Q          ARITH  NO DP
0882   REF   1               41,2267  1 2300 1          TCF    DPTEST1    DP1OUT
0883   REF   2  LAST  321   41,2270  1 2300 1          TCF    DPTEST1    DP2OUT
0884   REF  52  LAST  321   41,2271  0 0002 0          TC     Q          DPDEG  NO DP
0885   REF   3  LAST  321   41,2272  1 2300 1          TCF    DPTEST1    DP3OUT
0886   REF  53  LAST  321   41,2273  0 0002 0          TC     Q          HMS   NO DP
0887   REF  54  LAST  321   41,2274  0 0002 0          TC     Q          M/S   NO DP
0888   REF   4  LAST  321   41,2275  1 2300 1          TCF    DPTEST1    DP4OUT
08881  REF  55  LAST  321   41,2276  0 0002 0          TC     Q          ARITH1   NO DP
08882  REF  56  LAST  321   41,2277  0 0002 0          TC     Q          2INTOUT  NO DP TO GET HI PART IN MPAC
0889   REF  57  LAST  321   41,2300  50 002 0 DPTEST1   INDEX  Q
0890                         41,2301  0 0001 0          TC     1          RETURN TO L+2

0891   REF   4  LAST  315   41,2302  3 4333 0 REQDATX   CAF    R1D1
0892   REF   1               41,2303  1 2307 0          TCF    REQCOM
0893   REF   2  LAST  313   41,2304  3 4334 1 REQDATY   CAF    R2D1
0894   REF   2  LAST  321   41,2305  1 2307 0          TCF    REQCOM
0895   REF   3  LAST  318   41,2306  3 4335 0 REQDATZ   CAF    R3D1
0896   REF  24  LAST  318   41,2307  54 777 1 REQCOM    TS     DSPCOUNT
0897   REF  58  LAST  321   41,2310  4 0002 1          CS     Q
0898   REF   9  LAST  316   41,2311  55*013 0          TS     REQRET
0899   REF  39  LAST  314   41,2312  0 4555 0          TC     BANKCALL
0900   REF   2  LAST  314   41,2313   60437 1          CADR   5BLANK
0901   REF   2  LAST  317   41,2314  0 4443 0          TC     FLASHON
0902   REF   2  LAST  317   41,2315  0 0136 0 ENDRQDAT  TC     ENTEXIT

0903   REF   8  LAST  312   41,2316  55*002 0          TS     NOUNREG
0904   REF  59  LAST  321   41,2317  56 002 0 UPDATNN   XCH    Q
0905   REF   1               41,2320  54 117 1          TS     UPDATRET
0906                         41,2321  0 0006 1          EXTEND
0907   REF   3  LAST  317   41,2322  3 2114 1          DCA    LODNNLOC   SWITCH BANKS TO NOUN TABLE READING
0908   REF   5  LAST  317   41,2323  52 006 0          DXCH   Z          ROUTINE.
0909   REF   5  LAST  320   41,2324  10 146 0          CCS    NNADTEM
0910   REF  24  LAST  318   41,2325  6 4712 1          AD     ONE        NORMAL
0911   REF   1               41,2326  1 2331 0          TCF    PUTADD
0912   REF   2  LAST  321   41,2327  1 2332 0          TCF    PUTADD +1  MCTBS  DONT CHANGE NOUNADD
0913   REF   3  LAST  321   41,2330  1 2332 0          TCF    PUTADD +1  MCTBI  DONT CHANGE NOUNADD
0914   REF   4  LAST  318   41,2331  0 4317 0 PUTADD    TC     SETNCADR   ECADR INTO NOUNCADR. SETS EB, NOUNADD.
0915   REF   2  LAST  312   41,2332  3 4375 1          CAF    ND1
0916   REF  25  LAST  321   41,2333  54 777 1          TS     DSPCOUNT
0917   REF   9  LAST  321   41,2334  3 1002 1          CA     NOUNREG
0918   REF   1               41,2335  1 2344 1          TCF    UPDAT1

0919   REF  14  LAST  320   41,2336  55*001 0          TS     VERBREG
0920   REF  60  LAST  321   41,2337  56 002 0 UPDATVB   XCH    Q
0921   REF   2  LAST  321   41,2340  54 117 1          TS     UPDATRET
0922   REF   5  LAST  317   41,2341  3 4374 0          CAF    VD1
0923   REF  26  LAST  321   41,2342  54 777 1          TS     DSPCOUNT
```

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0924   REF  15  LAST  321   41,2343  3 1001 1          CA     VERBREG
0925   REF  17  LAST  318   41,2344  0 4574 C  UPDAT1   TC     POSTJUMP     CANT USE SWCALL TO GO TO DSPDECVN,SINCE
0926   REF   1               41,2345   61222 1          CADR   GOVNUPDT    UPDATVB CAN ITSELF BE CALLED BY SWCALL.
0927   REF   3  LAST  321   41,2346  0 0117 C          TC     UPDATRET

0928   REF   2  LAST  317   41,2347  0 4161 C  GOALMCYC TC     ALMCYCLE     NEEDED BECAUSE BANKJUMP CANT HANDLE F/F.

0929   REF  18  LAST  322   41,2350  0 4574 C  GODSPALM TC     POSTJUMP
0930   REF   2  LAST  318   41,2351   61323 1          CADR   DSPALARM
```

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R0931              NOUN   TABLES
R0932   NOUN CODE L/40, NORMAL NOUN CASE.  NOUN CODE G/E 40, MIXED NOUN CASE.
R0933   FOR NORMAL CASE, NNADTAB CONTAINS ONE       ECADR     FOR EACH NOUN.
R0934   +0 INDICATES NOUN NOT USED.   - ENTRY INDICATES MACHINE CADR(E OR F) TO
R0935   BE SPECIFIED. -1 INDICATES CHANNEL TO BE SPECIFIED. -0 INDICATES AUGMENT
R0936   OF LAST MACHINE CADR SUPPLIED.

R0937   FOR MIXED CASE, NNADTAB CONTAINS ONE INDIRECT ADDRESS(IDADDREL) IN LOW
R0938   10 BITS, AND THE COMPONENT CODE NUMBER IN THE HIGH 5 BITS.

R0939   NNTYPTAB IS A PACKED TABLE OF THE FORM MMMMNNNNNNPPPPP.

R0940   FOR THE NORMAL CASE, M-S ARE THE COMPONENT CODE NUMBER.
R0941                         N-S ARE THE SF ROUTINE CODE NUMBER.
R0942                         P-S ARE THE SF CONSTANT CODE NUMBER.

R0943   MIXED CASE,M-S ARE THE SF CONSTANT3 CODE NUMBER     3 COMPONENT CASE
R0944              N-S ARE THE SF CONSTANT2 CODE NUMBER
R0945              P-S ARE THE SF CONSTANT1 CODE NUMBER
R0946              N-S ARE THE SF CONSTANT2 CODE NUMBER     2 COMPONENT CASE
R0947              P-S ARE THE SF CONSTANT1 CODE NUMBER
R0948              P-S ARE THE SF CONSTANT1 CODE NUMBER      1 COMPONENT CASE

R0949   THERE IS ALSO AN INDIRECT ADDRESS TABLE(IDADDTAB) FOR MIXED CASE ONLY.
R0950   EACH ENTRY CONTAINS ONE ECADR.    IDADDREL IS THE RELATIVE ADDRESS OF
R0951   THE FIRST OF THESE ENTRIES.
R0952   THERE IS ONE ENTRY IN THIS TABLE FOR EACH COMPONENT OF A MIXED NOUN
R0953   THEY ARE LISTED IN ORDER OF ASCENDING K.

R0954   THERE IS ALSO A SCALE FACTOR ROUTINE NUMBER TABLE( RUTMXTAB ) FOR MIXED
R0955   CASE ONLY. THERE IS ONE ENTRY PER MIXED NOUN. THE FORM IS,
R0956         QQQQQRRRRRSSSSS
R0957   Q-S ARE THE SF ROUTINE 3 CODE NUMBER     3 COMPONENT CASE
R0958   R-S ARE THE SF ROUTINE 2 CODE NUMBER
R0959   S-S ARE THE SF ROUTINE 1 CODE NUMBER
R0960   R-S ARE THE SF ROUTINE 2 CODE NUMBER     2 COMPONENT CASE
R0961   S-S ARE THE SF ROUTINE 1 CODE NUMBER


R0962   IN OCTAL DISPLAY AND LOAD (OCT OR DEC) VERBS, EXCLUDE USE OF VERBS WHOSE
R0963   COMPONENT NUMBER IS GREATER THAN THE NUMBER OF COMPONENTS IN NOUN.
R0964   (ALL MACHINE ADDRESS TO BE SPECIFIED NOUNS ARE 3 COMPONENT.)


R0967   IN MULTI-COMPONENT LOAD VERBS, NO MIXING OF OCTAL AND DECIMAL DATA
R0968   COMPONENT WORDS IS ALLOWED. ALARM IF VIOLATION.

R0969   IN DECIMAL LOADS OF DATA, 5 NUMERICAL CHARACTERS MUST BE KEYED IN
R0970   BEFORE EACH ENTER. IF NOT, ALARM.
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P0971                DISPLAY  VERBS
 0972   REF  10  LAST  320   41,2352  4 4711 C  DSPABC   CS      TWO
 0973   REF   1              41,2353  0 2423 C           TC      COMPTEST
 0974   REF   3  LAST  320   41,2354  50 145 1           INDEX   NOUNADD
 0975                        41,2355  4 0002 1           CS      2
 0976   REF  36  LAST  299   41,2356  56 132 1           XCH     BUF     +2
 0977   REF  25  LAST  321   41,2357  4 4712 C  DSPAB    CS      ONE
 0978   REF   2  LAST  324   41,2360  0 2423 C           TC      COMPTEST
 0979   REF   4  LAST  324   41,2361  50 145 1           INDEX   NOUNADD
 0980                        41,2362  4 0001 1           CS      1
 0981   REF  37  LAST  324   41,2363  56 131 1           XCH     BUF     +1
 0982   REF   1              41,2364  0 2442 1  DSPA     TC      DECTEST
 0983   REF   1              41,2365  0 2465 1           TC      TSTFCRDP
 0984   REF   5  LAST  324   41,2366  50 145 1           INDEX   NOUNADD
 0985                        41,2367  4 0000 C           CS      0
 0986   REF  38  LAST  324   41,2370  56 130 C  DSPCOM1  XCH     BUF
 0987   REF   1              41,2371  0 2404 0           TC      DSPCOM2
 0988   REF  26  LAST  324   41,2372  4 4712 C  DSPB     CS      ONE
 0989   REF   1              41,2373  0 2436 1           TC      DCOMPTST
 0990   REF   6  LAST  324   41,2374  50 145 1           INDEX   NOUNADD
 0991                        41,2375  4 0001 1           CS      1
 0992   REF   1              41,2376  0 2370 1           TC      DSPCOM1
 0993   REF  11  LAST  324   41,2377  4 4711 C  DSPC     CS      TWO
 0994   REF   2  LAST  324   41,2400  0 2436 1           TC      DCOMPTST
 0995   REF   7  LAST  324   41,2401  50 145 1           INDEX   NOUNADD
 0996                        41,2402  4 0002 1           CS      2
 0997   REF   2  LAST  324   41,2403  0 2370 1           TC      DSPCOM1
 0998   REF  12  LAST  324   41,2404  4 4711 C  DSPCOM2  CS      TWO             A  B  C  AB  ABC
 0999   REF  16  LAST  322   41,2405  6 1001 1           AD      VERBREG         -1 -0 +1 +2  +3   IN A
 1000   REF  87  LAST  320   41,2406  10 000 C           CCS     A               +0 +0 +0 +1  +2    IN A AFTER CCS
 1001   REF   1              41,2407  0 2412 1           TC      DSPCOM3
 1002   REF   3  LAST  321   41,2410  0 0136 C           TC      ENTEXIT
 1003                        41,2411  0 2412 1           TC      +1
 1004   REF   1              41,2412  54 122 1  DSPCOM3  TS      DISTEM          +0,+1,+2 INTO DISTEM
 1005   REF  88  LAST  324   41,2413  50 000 1           INDEX   A
 1006   REF   5  LAST  321   41,2414  3 4333 C           CAF     R1D1
 1007   REF  27  LAST  321   41,2415  54 777 1           TS      DSPCOUNT
 1008   REF   2  LAST  324   41,2416  50 122 C           INDEX   DISTEM
 1009   REF  39  LAST  324   41,2417  4 0130 1           CS      BUF
 1010   REF   2  LAST  318   41,2420  0 3353 1           TC      DSPOCTWD
 1011   REF   3  LAST  324   41,2421  56 122 C           XCH     DISTEM
 1012   REF   2  LAST  324   41,2422  0 2406 1           TC      DSPCOM2 +2

R1013   COMPTEST ALARMS IF COMPONENT NUMBER OF VERB(LOAD OR OCT DISPLAY) IS
R1014   GREATER THAN THE HIGHEST COMPONENT NUMBER OF NOUN.
 1016   REF   4  LAST  264   41,2423  54 123 C  COMPTEST  TS      SFTEMP1         - VERB COMP
 1017   REF  61  LAST  321   41,2424  22 002 C           LXCH    Q
 1022   REF   1              41,2425  0 2512 C  COMPTST1  TC      GETCCMP
 1023   REF   1              41,2426  0 4345 1           TC      LEFT5
 1024   REF   8  LAST  316   41,2427  7 6214 1           MASK    THREE           NOUN COMP
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 1025   REF    5  LAST  324   41,2430  6 0123 1            AD      SFTEMP1          NOUN COMP - VERB COMP
 1026   REF   89  LAST  324   41,2431  10 000 0            CCS     A
 1027   REF   28  LAST  315   41,2432  0 0001 0            TC      L                NOUN COMP G/ VERB COMP
 1028   REF    3  LAST  314   41,2433  0 5642 1            TC      CCSHOLE
 1029   REF   16  LAST  320   41,2434  0 2350 0            TC      GODSPALM         NOUN COMP L/ VERB COMP
 1030   REF   29  LAST  325   41,2435  0 0001 0 NDCMPTST   TC      L                NOUN COMP = VERB COMP

R1031   DCCMPTST ALARMS IF DECIMAL ONLY BIT (BIT4 OF COMP CODE NUMBER) = 1.
R1032   IF NOT, IT PERFORMS REGULAR COMPTEST.
 1033   REF    6  LAST  325   41,2436  54 123 0 DCOMPTST   TS      SFTEMP1          - VERB COMP
 1034   REF   62  LAST  324   41,2437  22 002 0            LXCH    Q
 1035   REF    2  LAST  324   41,2440  0 2442 1            TC      DECTEST
 1036   REF    1              41,2441  0 2425 0            TC      COMPTST1

 1037                         41,2442  0 0006 1 DECTEST    EXTEND                   ALARMS IF DEC ONLY BIT = 1 (BIT4 OF COMP
 1038   REF   72  LAST  318   41,2443  22 156 0            QXCH    MPAC     +2      CODE NUMBER). RETURNS IF NOT.
 1039   REF    2  LAST  324   41,2444  0 2512 0            TC      GETCOMP
 1040   REF   25  LAST  223   41,2445  7 4675 0            MASK    BIT14
 1041   REF   90  LAST  325   41,2446  10 000 0            CCS     A
 1042   REF   17  LAST  325   41,2447  0 2350 0            TC      GODSPALM
 1043   REF   73  LAST  325   41,2450  0 0156 0            TC      MPAC     +2

 1044   REF   63  LAST  325   41,2451  22 002 0 DCTSTCYC   LXCH    Q                ALARMS AND RECYCLES IF DEC ONLY BIT = 1
 1045   REF    3  LAST  325   41,2452  0 2512 0            TC      GETCOMP          ( BIT4 OF COMP CODE NUMBER). RETURNS
 1046   REF   26  LAST  325   41,2453  7 4675 0            MASK    BIT14            IF NOT. USED BY LOAD VERBS.
 1047   REF   91  LAST  325   41,2454  10 000 0            CCS     A
 1048   REF    3  LAST  322   41,2455  0 4161 0            TC      ALMCYCLE
 1049   REF   30  LAST  325   41,2456  0 0001 0            TC      L

R1050   NCLNTEST ALARMS IF NO-LOAD BIT (BIT5 OF COMP CODE NUMBER) = 1.
R1051   IF NOT, IT RETURNS.
 1052   REF   64  LAST  325   41,2457  22 002 0 NOUNTEST   LXCH    Q
 1053   REF    4  LAST  325   41,2460  0 2512 0            TC      GETCOMP
 1054   REF   92  LAST  325   41,2461  10 000 0            CCS     A
 1055   REF   31  LAST  325   41,2462  0 0001 0            TC      L
 1056   REF   32  LAST  325   41,2463  0 0001 0            TC      L
 1057   REF   18  LAST  325   41,2464  0 2350 0            TC      GODSPALM

 1058   REF   65  LAST  325   41,2465  22 002 0 TSTFORDP   LXCH    Q                TEST FOR DP. IF SO, GET MINOR PART ONLY.
 1059   REF    6  LAST  321   41,2466  3 0146 1            CA      NNADTEM
 1060   REF   27  LAST  324   41,2467  6 4712 1            AD      ONE              IF NNADTEM = -1, CHANNEL TO BE SPECIFIED
 1061                         41,2470  0 0006 1            EXTEND
 1062   REF    1              41,2471  1 2503 1            BZF     CHANDSP
 1063   REF    4  LAST  317   41,2472  50 140 1            INDEX   MIXBR
 1064                         41,2473  0 2473 0            TC      +0
 1065                         41,2474  0 2476 0            TC      +2               NORMAL
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1066  REF  33  LAST  325  41,2475  0 0001 0          TC      L              MIXED CASE ALREADY HANDLED IN MIXNOUN
1067  REF   1               41,2476  0 3021 1          TC      SFRUTNOR
1068  REF   2  LAST  320  41,2477  0 2261 0          TC      DPTEST
1069  REF  34  LAST  326  41,2500  0 0001 0          TC      L              NO DP
1070  REF   8  LAST  324  41,2501  24 145 1          INCR    NOUNADD        DP    E+1 INTO NOUNADD FOR MINOR PART.
1071  REF  35  LAST  326  41,2502  0 0001 0          TC      L

1072                       41,2503  0 0006 1  CHANDSP  EXTEND
1073  REF   3  LAST  318  41,2504  5 1017 0          INDEX   NOUNCADR
1074                       41,2505  00 000 1          READ    0
1075  REF  93  LAST  325  41,2506  4 0000 0          CS      A
1076  REF   3  LAST  324  41,2507  1 2370 0          TCF     DSPCOM1

1077  REF   2  LAST  263  41,2510   00147 0  COMPICK  ADRES   NNTYPTEM
1078  REF   7  LAST  325  41,2511   00146 1           ADRES   NNADTEM

1079  REF   5  LAST  325  41,2512  50 140 1  GETCOMP  INDEX   MIXBR          NORMAL                  MIXED
1080  REF   1               41,2513  3 2507 1          CAF     COMPICK -1     ADRES NNTYPTEM          ADRES NNADTEM
1081  REF  94  LAST  326  41,2514  50 000 1          INDEX   A
1082                       41,2515  3 0000 1          CA      0              C(NNTYPTEM)             C(NNADTEM)
1083  REF   4  LAST  197  41,2516  7 4364 0          MASK    HI5            GET HI5 OF NNTYPTAB(NORM)OF NNADTAB(MIX)
1084  REF  66  LAST  325  41,2517  0 0002 0          TC      Q

1085  REF   5  LAST  325  41,2520  0 2512 0  DECDSP   TC      GETCOMP
1086  REF   2  LAST  324  41,2521  0 4345 1          TC      LEFT5
1087  REF   9  LAST  324  41,2522  7 6214 1          MASK    THREE
1088  REF   4  LAST  320  41,2523  54 117 1          TS      DECOUNT        COMP NUMBER INTO DECOUNT
1089  REF   1               41,2524  54 122 1  DSPDCGET TS      DECTEM         PICKS UP DATA
1090  REF   9  LAST  326  41,2525  6 0145 1          AD      NOUNADD        DECTEM  1COMP +0, 2COMP +1, 3COMP +2
1091  REF  95  LAST  326  41,2526  50 000 1          INDEX   A
1092                       41,2527  4 0000 0          CS      0
1093  REF   2  LAST  326  41,2530  50 122 0          INDEX   DECTEM
1094  REF   2  LAST  264  41,2531  57*003 0          XCH     XREG           CANT USE BUF SINCE DMP USES IT.
1095  REF   3  LAST  326  41,2532  10 122 1          CCS     DECTEM
1096  REF   1               41,2533  0 2524 0          TC      DSPDCGET       MORE TO GET
1097  REF  42  LAST  317  41,2534  3 4714 1  DSPDCPUT CAF     ZERO           DISPLAYS DATA
1098  REF  74  LAST  325  41,2535  54 155 1          TS      MPAC    +1     DECOUNT 1COMP +0, 2COMP +1, 3COMP +2
1099  REF  75  LAST  326  41,2536  54 156 1          TS      MPAC    +2
1100  REF   5  LAST  326  41,2537  50 117 0          INDEX   DECOUNT
1101  REF   6  LAST  324  41,2540  3 4333 0          CAF     R1D1
1102  REF  28  LAST  324  41,2541  54 777 1          TS      DSPCOUNT
1103  REF   6  LAST  326  41,2542  50 117 0          INDEX   DECOUNT
1104  REF   3  LAST  326  41,2543  4 1003 1          CS      XREG
1105  REF  76  LAST  326  41,2544  54 154 0          TS      MPAC
1106  REF   1               41,2545  0 3042 1          TC      SFCONUM        2X( SF CON NUMB ) IN A
1107  REF   7  LAST  325  41,2546  54 123 0          TS      SFTEMP1
1108                       41,2547  0 0006 1          EXTEND                 SWITCH BANKS TO SF CONSTANT TABLE
```

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1109   REF   1                  41,2550  3 2562 1          DCA     GTSFOUTL        READING ROUTINE.
1110   REF   6  LAST  321       41,2551  52 006 C          DXCH    Z               LOADS SFTEMP1, SFTEMP2.
1111   REF   6  LAST  326       41,2552  5C 140 1          INDEX   MIXBR
1112                            41,2553  0 2553 C          TC      +0
1113   REF   1                  41,2554  0 2557 1          TC      DSPSFNOR
1114   REF   2  LAST  32C       41,2555  C 3027 1          TC      SFRUTMIX
1115   REF   1                  41,2556  0 2572 C          TC      DECDSP3

1116   REF   2  LAST  326       41,2557  0 3021 1 DSPSFNOR TC      SFRUTNOR
1117   REF   2  LAST  327       41,2560  0 2572 C          TC      DECDSP3

1118   REF   29 LAST  326         0777                     EBANK=  DSPCOUNT
1119   REF   1                  41,2561    02120 C GTSFOUTL 2CADR  GTSFOUT
1119   REF   1                  41,2562    64101 C

1120   REF   40 LAST  321       41,2563  0 4555 C DSPDCEND TC      BANKCALL        ALL SFOUT ROUTINES END HERE
1121   REF   1                  41,2564    61131 C          CADR    DSPDECWD
1122   REF   7  LAST  326       41,2565  1C 117 1          CCS     DECOUNT
1123                            41,2566  0 2570 1          TC      +2
1124   REF   4  LAST  324       41,2567  0 0136 C          TC      ENTEXIT
1125   REF   8  LAST  327       41,2570  54 117 1          TS      DECOUNT
1126   REF   1                  41,2571  0 2534 1          TC      DSPDCPUT        MORE TO DISPLAY

1127   REF   96 LAST  326       41,2572  50 000 1 DECDSP3  INDEX   A
1128   REF   1                  41,2573  3 2575 1          CAF     SFOUTABR
1129   REF   2  LAST  318       41,2574  0 4577 C          TC      BANKJUMP

1130   REF   1                  41,2575    61321 C SFOUTABR CADR   PREDSPAL        ALARM IF DEC DISP WITH OCTAL ONLY NOUN
1131   REF   1                  41,2576    62563 C          CADR    DSPDCEND
1132   REF   1                  41,2577    60516 C          CADR    DECOUTSF
1133   REF   1                  41,2600    60603 1          CADR    ARTOUTSF
1134   REF   1                  41,2601    60614 1          CADR    DP1OUTSF
1135   REF   1                  41,2602    60621 1          CADR    DP2OUTSF
1136   REF   1                  41,2603    60524 1          CADR    DPDECOUT
1137   REF   1                  41,2604    60623 C          CADR    DP3OUTSF
1138   REF   1                  41,2605    65143 1          CADR    HMSOUT
1139   REF   1                  41,2606    65216 1          CADR    M/SOUT
1140   REF   2  LAST  327       41,2607    60621 1          CADR    DP2OUTSF
11401  REF   1                  41,2610    60610 C          CADR    AROUT1SF
11402  REF   1                  41,2611    60636 1          CADR    2INTOUT
1141                            41,2612                ENDRTOUT EQUALS

R1142          THE FOLLOWING IS ATYPICAL SF ROUTINE . IT USES MPAC. LEAVES RESU
R1143  LTS IN MPAC, MPAC+1. ENDS WITH TC DSPDCEND

1144   REF   2  LAST  315       40,2516                  SETLOC  BLANKCON +1
```

11445 REF 2 LAST 308 TO 316: 334 334* COUNT 40/PIN

R1145 DEGOUTSF SCALES BY .18 THE LOW 14 BITS OF ANGLE , ADDING .18 FOR
R1146 NUMBERS IN THE NEGATIVE (AGC) RANGE.

```
1147  REF  43  LAST  326   40,2516  3 4714 1  DEGOUTSF CAF    ZERO
1148  REF  77  LAST  326   40,2517  54 156 1           TS     MPAC    +2      SET INDEX FOR FULL SCALE
1149  REF   1              40,2520  0 2555 C           TC     FIXRANGE
1150                       40,2521  0 2523 1           TC     +2              NO AUGMENT NEEDED (SFTEMP1 AND 2 ARE 0)
1151  REF   1              40,2522  0 2550 C           TC     SETAUG          SET AUGMENTER ACCORDING TO C(MPAC +2)
1152  REF   1              40,2523  0 2566 C           TC     DEGCOM
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R1153 OPDEGOUT SCALES BY .45 (THE RANGE IS 90 DEGREES) AND ADDS A 20 DEG BIAS.

```
1154  REF  78  LAST  328   40,2524  10 154 C  OPDEGOUT CCS    MPAC            RANGE IS 90 DEG
1155  REF  79  LAST  328   40,2525  56 154 1           XCH    MPAC            IF POS OR POS 0 THEN ADD BIAS AND
1156                       40,2526  0 2531 1           TC     +3              CORRECT FOR POSSIBLE OVERFLOW
1157  REF   1              40,2527  0 2540 1           TC     NEGOPT          IF NEG NON ZERO
1158  REF   4  LAST  296   40,2530  6 7716 C           AD     NEG1            IF NEG ZERO SUBTRACT 1
1159  REF   1              40,2531  6 2602 1           AD     20BIAS
1160  REF  80  LAST  328   40,2532  54 154 C  BIASCOM   TS     MPAC            TEST FOR OVERFLOW
1161                       40,2533  0 2536 C           TC     +3              NO OVFLOW
1162  REF  22  LAST  317   40,2534  3 4674 C           CAF    BIT15           IF OVFLOW
1163  REF  81  LAST  328   40,2535  26 154 C           ADS    MPAC
1164  REF  13  LAST  324   40,2536  3 4711 1           CAF    TWO             SET MULTIPLIER TO .45
1165  REF   2  LAST  327   40,2537  0 2517 C           TC     DEGOUTSF +1

1166  REF  82  LAST  328   40,2540  56 154 1  NEGOPT    XCH    MPAC            NEGATIVE CASE
1167  REF   2  LAST  328   40,2541  6 2602 1           AD     20BIAS
1168  REF  97  LAST  327   40,2542  10 000 C           CCS    A
1169  REF   1              40,2543  0 2532 1           TC     BIASCOM         IF POS THEN SUBTRACT 1 BECAUSE OF 2SCOM
1170  REF   4  LAST  325   40,2544  0 5642 1           TC     CCSHOLE
1171  REF  28  LAST  325   40,2545  6 4712 1           AD     ONE             IF NEG RESTORE SUM
1172                       40,2546  4 0000 0           COM                    IF NEG 0 LEAVE NEG 0
1173  REF   2  LAST  328   40,2547  0 2532 1           TC     BIASCOM

1174                       40,2550  0 0006 1  SETAUG    EXTEND                 LOADS SFTEMP1 AND SFTEMP2 WITH THE
1175  REF  83  LAST  328   40,2551  5 0156 C           INDEX  MPAC    +2      DP AUGMENTER CONSTANT
1176  REF   1              40,2552  3 2577 C           DCA    DEGTAB
1177  REF   8  LAST  326   40,2553  52 124 1           DXCH   SFTEMP1
1178  REF  67  LAST  326   40,2554  0 0002 C           TC     Q

1179  REF  84  LAST  328   40,2555  10 154 C  FIXRANGE  CCS    MPAC            IF MPAC IS + RETURN TO L+1
1180  REF  68  LAST  328   40,2556  0 0002 C           TC     Q               IF MPAC IS - RETURN TO L+2 AFTER
1181  REF  69  LAST  328   40,2557  0 0002 C           TC     Q               MASKING OUT THE SIGN BIT
1182                       40,2560  1 2561 C           TCF    +1
1183  REF  23  LAST  328   40,2561  4 4674 1           CS     BIT15
1184  REF  85  LAST  328   40,2562  7 0154 C           MASK   MPAC
1185  REF  86  LAST  328   40,2563  54 154 C           TS     MPAC
1186  REF  70  LAST  328   40,2564  50 002 C           INDEX  Q
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1187                        40,2565  0 0001 0          TC     1

1188                        40,2566  0 0006 1  DEGCOM   EXTEND                  LOADS MULTIPLIER , DOES SHORTMP, AND
1189  REF  67  LAST  328    40,2567  5 0156 0          INDEX  MPAC    +2        ADDS AUGMENTER.
1190  REF   2  LAST  328    40,2570  3 2577 0          DCA    DEGTAB
1191  REF  88  LAST  329    40,2571  52 155 1          DXCH   MPAC              ADJUSTED ANGLE IN A
1192  REF   4  LAST  310    40,2572  0 7256 1          TC     SHORTMP
1193  REF   9  LAST  328    40,2573  52 124 1          DXCH   SFTEMP1
1194  REF  89  LAST  329    40,2574  20 155 1          DAS    MPAC
1195  REF   1              40,2575  0 2606 0          TC     SCOUTEND


1196                        40,2576   05605 1  DEGTAB   OCT    05605             HI PART OF     .18
1197                        40,2577   03656 1           OCT    03656             LOW PART OF    .18
1198                        40,2600   16314 0           OCT    16314             HI PART OF     .45
1199                        40,2601   31463 1           OCT    31463             LO PART OF     .45

1200                        40,2602   16040 1  20BIAS   OCT    16040             20 DEG BIAS FOR OPTICS

1201  REF  10  LAST  329    40,2603  52 124 1  ARTOUTSF DXCH   SFTEMP1           ASSUMES POINT AT LEFT OF DP SFCON
1202  REF  90  LAST  329    40,2604  52 155 1           DXCH   MPAC
1203  REF   1              40,2605  0 4431 0           TC     PRSHRTMP          IF C(A) = -0, SHORTMP FAILS TO GIVE -0.
1204  REF  19  LAST  322    40,2606  0 4574 0  SCOUTEND TC     POSTJUMP
1205  REF   2  LAST  327    40,2607   62563 0           CADR   DSPOCEND

12051 REF  11  LAST  329    40,2610  52 124 1  AROUT1SF DXCH   SFTEMP1           ASSUMES POINT BETWEEN HI AND LO PARTS OF
12052 REF  91  LAST  329    40,2611  52 155 1           DXCH   MPAC              DP SFCON. SHIFTS RESULTS LEFT 14, BY
12053 REF   2  LAST  329    40,2612  0 4431 0           TC     PRSHRTMP          TAKING RESULTS FROM MPAC+1, MPAC+2.
12054 REF   1              40,2613  0 2615 1           TC     L14/OUT


1206  REF   1              40,2614  0 2627 0  DP1OUTSF TC     DPOUT             SCALES MPAC, MPAC +1 BY DP SCALE FACTOR
1207  REF  92  LAST  329    40,2615  56 156 0  L14/OUT  XCH    MPAC    +2        IN SFTEMP1, SFTEMP2. THEN SCALE RESULT
1208  REF  93  LAST  329    40,2616  56 155 0           XCH    MPAC    +1        BY B14.
1209  REF  94  LAST  329    40,2617  54 154 0           TS     MPAC
1210  REF   2  LAST  329    40,2620  0 2606 0           TC     SCOUTEND


1211  REF   2  LAST  329    40,2621  0 2627 0  DP2OUTSF TC     DPOUT             SCALES MPAC , MPAC +1 BY DP SCALE FACTOR
1212  REF   3  LAST  329    40,2622  0 2606 0           TC     SCOUTEND


1213  REF   3  LAST  329    40,2623  0 2627 0  DP3OUTSF TC     DPOUT             ASSUMES POINT BETWEEN BITS 7-8 OF HIGH
1214  REF  12  LAST  320    40,2624  3 6211 0           CAF    SIX               LEFT BY 7, ROUNDS MPAC+2 INTO MPAC+1.
1215  REF   1              40,2625  0 3056 1           TC     TPLEFTN           SHIFT LEFT 7.
1216  REF   4  LAST  329    40,2626  0 2606 0           TC     SCOUTEND


12165 REF  95  LAST  329        0162          MPAC+6   =      MPAC +6           USE MPAC +6 INSTEAD OF OVFIND
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 1217   REF  71  LAST  328   40,2627  56 002 C  DPOUT    XCH     Q
 1218   REF   1              40,2630  54 162 C           TS      MPAC+6
 1219   REF   1              40,2631  0 2653 C           TC      READLO          GET FRESH DATA FOR BOTH HI AND LO.
 1220   REF   2  LAST  239   40,2632  0 7226 C           TC      TPAGREE         MAKE DP DATA AGREE
 1221   REF   2  LAST  310   40,2633  0 7052 1           TC      DMP
 1222   REF  12  LAST  329   40,2634   00123 1           ADRES   SFTEMP1
 1223   REF   2  LAST  330   40,2635  0 0162 1           TC      MPAC+6
R12231  THE FOLLOWING ROUTINE DISPLAYS TWO CONTIGUOUS SP POSITIVE INTEGERS
R12232  AS TWO POSITIVE DECIMAL INTEGERS IN RXD1-RXD2 AND RXD4-RXD5 (RXD3 IS
R12233  BLANKED). THE INTEGER IN THE LOWER NUMBERED ADDRESS IS DISPLAYED IN
R12234  RXD1-RXD2.

 12235  REF   3  LAST  321   40,2636  0 2437 C  2INTOUT  TC      5BLANK          TO BLANK RXD3
 122355 REF   2  LAST  312   40,2637  0 2314 C           TC      +ON             TURN ON + SIGN
 12236  REF  96  LAST  329   40,2640  3 0154 1           CA      MPAC
 12237  REF   1              40,2641  0 3211 C           TC      DSPDECVN        DISPLAY 1ST INTEGER (LIKE VERB AND NOUN)
 122371 REF  10  LAST  326   40,2642  4 6214 1           CS      THREE
 122372 REF   9  LAST  327   40,2643  50 117 C           INDEX   DECOUNT
 122373 REF   7  LAST  326   40,2644  6 4333 C           AD      R1D1            RXD4
 122374 REF  30  LAST  327   40,2645  54 777 1           TS      DSPCOUNT
 122375 REF   2  LAST  330   40,2646  0 2653 C           TC      READLO          GET 2ND INTEGER
 122376 REF  97  LAST  330   40,2647  3 0155 C           CA      MPAC +1
 122377 REF   2  LAST  330   40,2650  0 3211 C           TC      DSPDECVN        DISPLAY 2ND INTEGER (LIKE VERB AND NOUN)
 122378 REF  20  LAST  329   40,2651  0 4574 C           TC      POSTJUMP
 122379 REF   3  LAST  329   40,2652   62565 C           CADR    DSPDCEND +2


R1224   READLO PICKS UP FRESH DATA FOR BOTH HI AND LO AND LEAVES IT IN
R1225   MPAC, MPAC+1. THIS IS NEEDED FOR TIME DISPLAY. IT ZEROES MPAC+2, BUT
R1226   DOES NOT FORCE TPAGREE.

 1227   REF  72  LAST  330   40,2653  56 002 C  READLO    XCH     Q
 1228   REF   8  LAST   68   40,2654  54 144 1           TS      TEM4
 1229   REF   7  LAST  327   40,2655  50 140 1           INDEX   MIXBR
 1230                        40,2656  0 2656 C           TC      +0
 1231   REF   1              40,2657  0 2673 1           TC      RDLONOR
 1232   REF  10  LAST  330   40,2660  50 117 C           INDEX   DECOUNT
 1233   REF   3  LAST  320   40,2661  3 0150 C           CA      IDADITEM        GET IDADDTAB ENTRY FOR COMP K OF NOUN.
 1234   REF   4  LAST  320   40,2662  7 4372 1           MASK    LOW11           E SUBK
 1235   REF   2  LAST  320   40,2663  0 4327 C           TC      SETEBANK        SET EB, LEAVE EADRES IN A.
 1236                        40,2664  0 0006 1  READLO1  EXTEND                  MIXED           NORMAL
 1237   REF  98  LAST  328   40,2665  5 0000 1           INDEX   A               C(ESUBK)        C(E)
 1238                        40,2666  3 0001 C           DCA     0               C((E SUBK)+1)       C(E+1)
 1239   REF  98  LAST  330   40,2667  52 155 1           DXCH    MPAC
 1240   REF  44  LAST  328   40,2670  3 4714 1           CAF     ZERO
 1241   REF  99  LAST  330   40,2671  54 156 1           TS      MPAC    +2
 1242   REF   9  LAST  330   40,2672  0 0144 C           TC      TEM4

 1243   REF  10  LAST  326   40,2673  3 0145 1  RDLONOR   CA      NOUNADD         E
 1244   REF   1              40,2674  0 2664 1  ENDRDLO   TC      READLO1
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 1245                                  42,3143                 BANK   42
 1245C1 REF   2  LAST  263             42,2000                 SETLOC PINBALL3
 1245C2                                42,3143                 BANK

 12455  REF   1                                                COUNT  42/PIN

 1246   REF  41  LAST  327             42,3143  0 4555 C HMSOUT TC     BANKCALL        READ FRESH DATA FOR HI AND LO INTO MPAC,
 1247   REF   3  LAST  330             42,3144   60653 1       CADR   READLO          MPAC+1.
 1248   REF   3  LAST  330             42,3145  0 7226 C       TC     TPAGREE         MAKE CP DATA AGREE
 1249   REF   1                       42,3146  0 3332 C       TC     SEPSECNR        LEAVE FRACT SEC/60 IN MPAC, MPAC+1.LEAVE
A1250                                                                                 WHOLE MIN IN BIT13 OF LOTEMOUT AND ABOVE
 1251   REF   3  LAST  330             42,3147  0 7052 1       TC     DMP             USE ONLY FRACT SEC/60 MOD 60
 1252   REF   1                       42,3150   03204 1       ADRES  SECON2          MULT BY .06
 1253   REF   4  LAST  321             42,3151  3 4335 C       CAF    R3D1            GIVES CENTI-SEC/10EXP5 MOD 60
 1254   REF  31  LAST  330             42,3152  54 777 1       TS     DSPCOUNT
 1255   REF  42  LAST  331             42,3153  0 4555 C       TC     BANKCALL        DISPLAY SEC MOD 60
 1256   REF   2  LAST  327             42,3154   61131 C       CADR   DSPDECWD
 1257   REF   1                       42,3155  0 3350 1       TC     SEPMIN          REMOVE REST OF SECONDS
 1258   REF   1                       42,3156  3 3206 C       CAF    MINCON2         LEAVE FRACT MIN/60 IN MPAC+1. LEAVE
 1259   REF 100  LAST  330             42,3157  56 154 1       XCH    MPAC            WHOLE HOURS IN MPAC.
 1260   REF   1                       42,3160  55'007 C       TS     HITEMOUT        SAVE WHOLE HOURS.
 1261   REF   2  LAST  331             42,3161  3 3207 1       CAF    MINCON2 +1
 1262   REF 101  LAST  331             42,3162  56 155 C       XCH    MPAC    +1      USE ONLY FRACT MIN/60 MOD 60
 1263   REF   3  LAST  329             42,3163  0 4431 C       TC     PRSHRTMP        IF C(A) = -0, SHORTMP FAILS TO GIVE -0.
A1264                                                                                 MULT BY .0006
 1265   REF   3  LAST  321             42,3164  3 4334 1       CAF    R2D1            GIVES MIN/10EXP5 MOD 60
 1266   REF  32  LAST  331             42,3165  54 777 1       TS     DSPCOUNT
 1267   REF  43  LAST  331             42,3166  0 4555 C       TC     BANKCALL        DISPLAY MIN MOD 60
 1268   REF   3  LAST  331             42,3167   61131 C       CADR   DSPDECWD
 1269                                  42,3170  C 0006 1       EXTEND                 MINUTES, SECONDS HAVE BEEN REMOVED
 1270   REF   1                       42,3171  3 3213 1       DCA    HRCON1
 1271   REF 102  LAST  331             42,3172  52 155 1       DXCH   MPAC
 1272   REF   2  LAST  331             42,3173  3 1007 1       CA     HITEMOUT        USE WHOLE HOURS
 1273   REF   4  LAST  331             42,3174  0 4431 C       TC     PRSHRTMP        IF C(A) = -0, SHORTMP FAILS TO GIVE -0.
A1274                                                                                 MULT BY .16384
 1275   REF   8  LAST  330             42,3175  3 4333 C       CAF    R1D1            GIVES HOURS/10EXP5
 1276   REF  33  LAST  331             42,3176  54 777 1       TS     DSPCOUNT
 1277   REF  44  LAST  331             42,3177  0 4555 C       TC     BANKCALL        USE REGULAR DSPDECWD, WITH ROUND OFF.
 1278   REF   4  LAST  331             42,3200   61131 C       CADR   DSPDECWD
 1279   REF   5  LAST  327             42,3201  0 0136 C       TC     ENTEXIT

 1280                                  42,3202   25660 C SECON1  2DEC*  1.666666666 E-4 B12*  2EXP12/6000
 1280                                  42,3203   31742 1
 1281                                  42,3204   01727 1 SECON2  OCT    01727           .06 FOR SECONDS DISPLAY
 1282                                  42,3205   01217 1         OCT    01217
 1283                                  42,3206   00011 1 MINCON2 OCT    00011           .0006 FOR MINUTES DISLPAY
 1284                                  42,3207   32445 C         OCT    32445
 1285                                  42,3210   02104 C MINCON1 OCT    02104           .066..66 UPPED BY 2EXP-28
 1286                                  42,3211   10422 1         OCT    10422
 1287                                  42,3212   05174 C HRCON1  2DEC   .16384
 1287                                  42,3213   13261 C
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1288                          42,3214   00000 1          OCT     00000
1289                          42,3215   00062 0  RNDCON  OCT     00062          .5 SEC

1290  REF  45  LAST  331      42,3216  0 4555 0  M/SOUT  TC      BANKCALL       READ FRESH DATA FOR HI AND LO INTO MPAC,
1291  REF   4  LAST  331      42,3217    60653 1          CADR    READLO         MPAC+1.
1292  REF   4  LAST  331      42,3220  0 7226 0          TC      TPAGREE        MAKE DP DATA AGREE
1293  REF 103  LAST  331      42,3221  10 154 0          CCS     MPAC           IF MAG OF (MPAC, MPAC+1) G/ 59 M 59 S,
1294                          42,3222  0 3224 0          TC      +2             DISPLAY 59859, WITH PROPER SIGN.
1295  REF   1                 42,3223  0 3255 0          TC      M/SNORM        MPAC = +0. L/ 59M58.5S
1296  REF   1                 42,3224  6 3312 1          AD      M/SCON1        - HI PART OF (59M58.5S) +1  FOR CCS
1297  REF  99  LAST  330      42,3225  10 000 0          CCS     A              MAG OF MPAC - HI PART OF (59M58.5S)
1298  REF   1                 42,3226  0 3241 0          TC      M/SLIMIT       G/ 59M58.5S
1299  REF   2  LAST  332      42,3227  0 3255 0          TC      M/SNORM        ORIGINAL MPAC = -0. L/ 59M58.5S
1300  REF   3  LAST  332      42,3230  0 3255 0          TC      M/SNORM        L/ 59M58.5S
1301  REF 104  LAST  332      42,3231  10 155 1          CCS     MPAC    +1     MAG OF MPAC = HI PART OF 59M58.5S
1302                          42,3232  0 3234 1          TC      +2
1303  REF   4  LAST  332      42,3233  0 3255 0          TC      M/SNORM        MPAC+1 = +0. L/ 59M58.5S
1304  REF   1                 42,3234  6 3313 0          AD      M/SCON2        - LO PART OF (59M58.5S) +1  FOR CCS
1305  REF 100  LAST  332      42,3235  10 000 0          CCS     A              MAG OF MPAC+1 - LO PART OF (59M58.5S)
1306  REF   2  LAST  332      42,3236  0 3241 0          TC      M/SLIMIT       G/ 59M58.5S
1307  REF   5  LAST  332      42,3237  0 3255 0          TC      M/SNORM        ORIGINAL MPAC+1 = -0. L/ 59M58.5S
1308  REF   6  LAST  332      42,3240  0 3255 0          TC      M/SNORM        L/ 59M58.5S
1309  REF 105  LAST  332      42,3241  10 154 0  M/SLIMIT CCS     MPAC           = 59M58.5S    LIMIT
1310  REF   1                 42,3242  3 3315 0          CAF     M/SCON3        MPAC CANNOT BE +/- 0 AT THIS POINT.
1311  REF   1                 42,3243  0 3252 1          TC      +LIMIT         FORCE MPAC, MPAC+1 TO +/- 59M59.5S
1312  REF   2  LAST  332      42,3244  4 3315 1          CS      M/SCON3
1313  REF 106  LAST  332      42,3245  54 154 0          TS      MPAC           WILL DISPLAY 59M59S IN DSPDECNR
1314  REF   3  LAST  332      42,3246  4 3316 1          CS      M/SCON3 +1
1315  REF 107  LAST  332      42,3247  54 155 1  LIMITCOM TS     MPAC    +1
1316  REF   1                 42,3250  3 3314 1          CAF     NORMADR        SET RETURN TO M/SNORM+1.
1317  REF   2  LAST  331      42,3251  0 3333 1          TC      SEPSECNR +1
1318  REF 108  LAST  332      42,3252  54 154 0  +LIMIT  TS      MPAC
1319  REF   4  LAST  332      42,3253  3 3316 0          CAF     M/SCON3 +1
1320  REF   1                 42,3254  0 3247 0          TC      LIMITCOM
1321  REF   1                 42,3255  0 3317 1  M/SNORM TC      SEPSEC         LEAVE FRACT SEC/60 IN MPAC,MPAC+1. LEAVE
A1322                                                                            WHOLE MIN IN BIT13 OF LOTEMOUT AND ABOVE
1323  REF   1                 42,3256  3 3310 0          CAF     HISECON        USE ONLY FRACT SEC/60 MOD 60
1324  REF   5  LAST  329      42,3257  0 7256 1          TC      SHORTMP        MULT BY .6 + 2EXP-14
1325  REF  11  LAST  330      42,3260  4 6214 1          CS      THREE          GIVES SEC/100 MOD 60
1326  REF  34  LAST  331      42,3261  26 777 1          ADS     DSPCOUNT       DSPCOUNT ALREADY SET TO RXD1
1327  REF  46  LAST  332      42,3262  0 4555 0          TC      BANKCALL       DISPLAY SEC MOD 60 IN D4D5.
1328  REF   1                 42,3263    61171 1          CADR    DSPDC2NR
1329  REF  45  LAST  330      42,3264  3 4714 1          CAF     ZERO
1330  REF   5  LAST  315      42,3265  54 124 1          TS      CODE
1331  REF  14  LAST  328      42,3266  4 4711 0          CS      TWO
1332  REF  11  LAST  330      42,3267  50 117 0          INDEX   DECOUNT
1333  REF   9  LAST  331      42,3270  6 4333 0          AD      R1D1           RXD3
1334  REF   3  LAST  315      42,3271  54 143 0          TS      COUNT
1335  REF  47  LAST  332      42,3272  0 4555 0          TC      BANKCALL       BLANK MIDDLE CHAR
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1336	REF 3	LAST 315	42,3273	61225 C		CADR	DSPIN		
1337	REF 2	LAST 331	42,3274	0 3350 1		TC	SEPMIN		REMOVE REST OF SECONDS
1338	REF 109	LAST 332	42,3275	56 155 C		XCH	MPAC +1		LEAVE FRACT MIN/60 IN MPAC+1
1339			42,3276	C 0006 1		EXTEND			USE ONLY FRACT MIN/60 MOD 60
1340	REF 1		42,3277	7 3311 C		MP	HIMINCON		MULT BY .6 + 2EXP-7
1341	REF 110	LAST 333	42,3300	52 155 1		DXCH	MPAC		GIVES MIN/100 MOD 60
1342	REF 12	LAST 332	42,3301	50 117 C		INDEX	DECOUNT		
1343	REF 10	LAST 332	42,3302	3 4333 C		CAF	R1D1		RXD1
1344	REF 35	LAST 332	42,3303	54 777 1		TS	DSPCOUNT		
1345	REF 48	LAST 332	42,3304	0 4555 C		TC	BANKCALL		DISPLAY MIN MOD 60 IN D1D2.
1346	REF 2	LAST 332	42,3305	61171 1		CADR	DSPDC2NR		
1347	REF 21	LAST 330	42,3306	0 4574 C		TC	POSTJUMP		
1348	REF 4	LAST 330	42,3307	62565 C		CADR	DSPDCEND +2		
1349			42,3310	23147 1	HISECON	OCT	23147		.6 + 2EXP-14
1350			42,3311	23346 1	HIMINCON	OCT	23346		.6 + 2EXP-7
1351			42,3312	77753 C	M/SCON1	OCT	77753		- HI PART OF (59M58.5S) +1
1352			42,3313	41126 1	M/SCON2	OCT	41126		- LO PART OF (59M58.5S) +1
1353	REF 7	LAST 332	42,3314	03256 C	NORMADR	ADRES	M/SNORM +1		
1354			42,3315	00025 C	M/SCON3	OCT	00025		59M 59.5S
1355			42,3316	37016 1		OCT	37016		
1356	REF 111	LAST 333	42,3317	10 155 1	SEPSEC	CCS	MPAC +1		IF +, ROUND BY ADDING .5 SEC
1357	REF 1		42,3320	1 3327 C		TCF	POSEC		IF -, ROUND BY SUBTRACTING .5 SEC
1358	REF 2	LAST 333	42,3321	1 3327 C		TCF	POSEC		FINDS TIME IN MPAC, MPAC+1
1359			42,3322	1 3323 1		TCF	+1		ROUNDS OFF BY +/- .5 SEC
1360			42,3323	0 0006 1		EXTEND			LEAVES WHOLE MIN IN BIT13 OF
1361	REF 1		42,3324	4 3215 C		DCS	RNDCON -1		LOTEMOUT AND ABOVE.
1362	REF 112	LAST 333	42,3325	20 155 1	SEPSEC1	DAS	MPAC		LEAVES FRACT SEC/60 IN MPAC, MPAC+1.
1363	REF 3	LAST 332	42,3326	1 3332 1		TCF	SEPSECNR		
1364			42,3327	0 0006 1	POSEC	EXTEND			
1365	REF 2	LAST 333	42,3330	3 3215 1		DCA	RNDCON -1		
1366	REF 1		42,3331	1 3325 1		TCF	SEPSEC1		
1367	REF 73	LAST 330	42,3332	56 002 C	SEPSECNR	XCH	Q		THIS ENTRY AVOIDS ROUNDING BY .5 SEC
1368	REF 1		42,3333	54 144 1		TS	SEPSCRET		
1369	REF 4	LAST 331	42,3334	0 7052 1		TC	DMP		MULT BY 2EXP12/6000
1370	REF 1		42,3335	03202 1		ADRES	SECON1		GIVES FRACT SEC/60 IN BIT12 OF MPAC+1
1371			42,3336	0 0006 1		EXTEND			AND BELOW.
1372	REF 113	LAST 333	42,3337	3 0155 C		DCA	MPAC		SAVE MINUTES AND HOURS
1373	REF 3	LAST 331	42,3340	53'010 C		DXCH	HITEMOUT		
1374	REF 1		42,3341	0 4420 C		TC	TPSL1		
1375	REF 2	LAST 333	42,3342	0 4420 C		TC	TPSL1		GIVES FRACT SEC/60 IN MPAC+1, MPAC+2.
1376	REF 46	LAST 332	42,3343	3 4714 1		CAF	ZERO		
1377	REF 114	LAST 333	42,3344	56 156 C		XCH	MPAC +2		LEAVE FRACT SEC/60 IN MPAC, MPAC+1.
1378	REF 115	LAST 333	42,3345	56 155 C		XCH	MPAC +1		
1379	REF 116	LAST 333	42,3346	56 154 1		XCH	MPAC		
1380	REF 2	LAST 333	42,3347	0 0144 C		TC	SEPSCRET		

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 1381   REF  74  LAST  333   42,3350  56 002 0  SEPMIN   XCH     Q           FINDS WHOLE MINUTES IN BIT13
 1382   REF   1               42,3351  54 144 1           TS      SEPMNRET    OF LOTEMOUT AND ABOVE.
 1383   REF   1               42,3352  3 1010 1           CA      LOTEMOUT    REMOVES REST OF SECONDS.
 1384                         42,3353  0 0006 1           EXTEND              LEAVES FRACT MIN/60 IN MPAC+1.
 1385   REF  13  LAST  182    42,3354  7 4710 1           MP      BIT3        LEAVES WHOLE HOURS IN MPAC.
 1386                         42,3355  0 0006 1           EXTEND              SR 12, THROW AWAY LP.
 1387   REF  17  LAST  192    42,3356  7 4676 0           MP      BIT13       SR 2, TAKE FROM LP. = SL 12.
 1388   REF 117  LAST  333    42,3357  22 155 0           LXCH    MPAC    +1  THIS FORCES BITS 12-1 TO 0 IF +,
A1389                                                                        FORCES BITS 12-1 TO 1 IF -.
 1390   REF   4  LAST  333    42,3360  3 1007 1           CA      HITEMOUT
 1391   REF 118  LAST  334    42,3361  54 154 0           TS      MPAC
 1392   REF   5  LAST  333    42,3362  0 7052 1           TC      DMP         MULT BY 1/15
 1393   REF   1               42,3363   03210 1           ADRES   MINCDN1     GIVES FRACT MIN/60 IN MPAC+1.
 1394   REF   2  LAST  334    42,3364  0 0144 0  ENDSPMIN TC      SEPMNRET    GIVES WHOLE HOURS IN MPAC.


R1395   THIS IS A SPECIAL PURPOSE VERB FOR DISPLAYING A DOUBLE PRECISION AGC
R1396   WORD AS 10 DECIMAL DIGITS ON THE AGC DISPLAY PANEL.  IT CAN BE USED WITH
R1397   ANY NOUN, EXCEPT MIXED NOUNS. IT DISPLAYS THE CONTENTS
R1398   OF THE REGISTER NOUNADD IS POINTING TO .  IF USED WITH NOUNS WHICH ARE
R1399   INHERENTLY NOT DP SUCH AS THE CDU COUNTERS THE DISPLAY WILL BE GARBAGE.
R1400   DISPLAY IS IN R1 AND R2 ONLY WITH THE SIGN IN R1.

 1401   REF   1               40,2675                    SETLOC  ENDRCLO  +1

14015   REF   3 LAST  328 TO  331:   111   445*          COUNT   40/PIN

 1402   REF   8  LAST  330   40,2675  5C 140 1  DSPCPDEC INDEX   MIXBR
 1403                         40,2676  0 2676 1           TC      +0
 1404                         40,2677  0 2701 0           TC      +2              NORMAL NOUN
 1405   REF   3  LAST  322    40,2700  0 3323 0           TC      DSPALARM
 1406                         40,2701  0 0006 1           EXTEND
 1407   REF  11  LAST  330    40,2702  5 0145 1           INDEX   NOUNADD
 1408                         40,2703  3 0001 0           DCA     0
 1409   REF 119  LAST  334    40,2704  52 155 1           DXCH    MPAC
 1410   REF  11  LAST  333    40,2705  3 4333 0           CAF     R1D1
 1411   REF  36  LAST  333    40,2706  54 777 1           TS      DSPCOUNT
 1412   REF  47  LAST  333    40,2707  3 4714 1           CAF     ZERO
 1413   REF 120  LAST  334    40,2710  54 156 1           TS      MPAC  +2
 1414   REF   5  LAST  332    40,2711  0 7226 0           TC      TPAGREE
 1415   REF   1               40,2712  0 3176 1           TC      DSP2DEC
 1416   REF   6  LAST  331    40,2713  0 0136 0  ENDDPDEC TC      ENTEXIT
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P1417   LOAD VERBS              IF ALARM CONDITION IS DETECTED DURING EXECUTE,
R1418   CHECK FAIL LIGHT IS TURNED ON AND ENDOFJOB. IF ALARM CONDITION IS
R1419   DETECTED DURING ENTER OF DATA, CHECK FAIL IS TURNED ON AND IT RECYCLES
R1420   TO EXECUTE  OF ORIGINAL LOAD VERB. RECYCLE CAUSED BY  1) DECIMAL MACHINE
R1421   CADR  2) MIXTURE OF OCTAL/DECIMAL DATA  3) OCTAL DATA INTO DECIMAL
R1422   ONLY NOUN  4) DEC DATA INTO OCT ONLY NOUN  5) DATA TOO LARGE FOR SCALE
R1423   6) FEWER THAN 3 DATA WORDS LOADED FOR HRS, MIN, SEC NOUN.8(2)-(6) ALARM
R1424   AND RECYCLE OCCUR AT FINAL ENTER OF SET. (1) ALARM AND RECYCLE OCCUR AT
R1425   ENTER OF CADR.


 1426   REF   1                 41,2612                         SETLOC ENDRTOUT

 14265  REF   2 LAST  316 TO  328:   394   394*                 COUNT  41/PIN

 1427   REF  15  LAST  332    41,2612  4 4711 0  ABCLOAD  CS     TWO
 1428   REF   3  LAST  324    41,2613  0 2423 0           TC     COMPTEST
 1429   REF   1                41,2614  0 2457 0           TC     NOUNTEST        TEST IF NOUN CAN BE LOADED.
 1430   REF   1                41,2615  3 3001 0           CAF    VBSP1LD
 1431   REF   2  LAST  314    41,2616  0 2336 0           TC     UPDATVB  -1
 1432   REF   1                41,2617  0 2302 1           TC     REQDATX
 1433   REF   1                41,2620  3 3002 0           CAF    VBSP2LD
 1434   REF   3  LAST  335    41,2621  0 2336 0           TC     UPDATVB  -1
 1435   REF   1                41,2622  0 2304 1           TC     REQDATY
 1436   REF   1                41,2623  3 3003 1           CAF    VBSP3LD
 1437   REF   4  LAST  335    41,2624  0 2336 0           TC     UPDATVB -1
 1438   REF   2  LAST  317    41,2625  0 2306 0           TC     REQDATZ


 1439   REF  13  LAST  329    41,2626  4 6211 1  PUTXYZ   CS     SIX             TEST THAT THE 3 DATA WORDS LOADED ARE
 1440   REF   1                41,2627  0 3004 0           TC     ALLDC/OC        ALL DEC OR ALL OCT.
 1441                          41,2630  0 0006 1           EXTEND
 1442   REF   4  LAST  321    41,2631  3 2114 1           DCA    LODNRLOC        SWITCH BANKS TO NOUN TABLE READING
 1443   REF   7  LAST  327    41,2632  52 006 0           DXCH   Z               ROUTINE.
 1444   REF  48  LAST  334    41,2633  3 4714 1           CAF    ZERO            X COMP
 1445   REF   1                41,2634  0 3070 0           TC     PUTCOM
 1446   REF  12  LAST  334    41,2635  50 145 1           INDEX  NOUNADD
 1447                          41,2636  54 000 0           TS     0
 1448   REF  29  LAST  328    41,2637  3 4712 1           CAF    ONE             Y COMP
 1449   REF   2  LAST  335    41,2640  0 3070 0           TC     PUTCOM
 1450   REF  13  LAST  335    41,2641  50 145 1           INDEX   NOUNADD
 1451                          41,2642  54 001 1           TS     1
 1452   REF  16  LAST  335    41,2643  3 4711 1           CAF    TWO             Z COMP
 1453   REF   3  LAST  335    41,2644  0 3070 0           TC     PUTCOM
 1454   REF  14  LAST  335    41,2645  50 145 1           INDEX  NOUNADD
 1455                          41,2646  54 002 1           TS     2
 1455C1 REF   5  LAST  224    41,2647  4 4716 1           CS     SEVEN           IF NOUN 7 HAS JUST BEEN LOADED, SET
 1455C2 REF  10  LAST  321    41,2650  6 1002 1           AD     NOUNREG          FLAG BITS AS SPECIFIED.
 1455C3                       41,2651  0 0006 1           EXTEND
 1455C4                       41,2652  1 2654 0           BZF    +2
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145505 REF   2  LAST  316   41,2653  0 2771 1          TC      LOADLV
145506 REF   4  LAST  326   41,2654  3 1003 C          CA      XREG          ECADR OF FLAG WORD.
145507 REF   5  LAST  321   41,2655  0 4320 1          TC      SETNCADR +1    SET EBANK, NOUNADD.
145508 REF   2  LAST  317   41,2656  3 1005 C          CA      ZREG          ZERO TO RESET BITS, NON-ZERO TO SET BITS
145509                      41,2657  0 0004 0          INHINT
14551                       41,2660  0 0006 1          EXTEND
145511 REF   1              41,2661  1 2670 C          BZF     BITSOFF
145512 REF  15  LAST  335   41,2662  50 145 1          INDEX   NOUNADD
145513                      41,2663  4 0000 0          CS      0
145514 REF   1              41,2664  7 1004 C          MASK    YREG          BITS TO BE PROCESSED.
145515 REF  16  LAST  336   41,2665  50 145 1          INDEX   NOUNADD
145516                      41,2666  26 000 C          ADS     0             SET BITS.
145517 REF   1              41,2667  0 2675 1          TC      BITSOFF1
145518 REF   2  LAST  336   41,2670  4 1004 C  BITSOFF  CS      YREG          BITS TO BE PROCESSED.
145519 REF  17  LAST  336   41,2671  50 145 1          INDEX   NOUNADD
14552                       41,2672  7 0000 C          MASK    0
145521 REF  18  LAST  336   41,2673  50 145 1          INDEX   NOUNADD
145522                      41,2674  54 000 C          TS      0             RESET BITS.
145523                      41,2675  0 0003 1  BITSOFF1 RELINT
1456   REF   3  LAST  336   41,2676  0 2771 1          TC      LOADLV

1457   REF  30  LAST  335   41,2677  4 4712 C  ABLOAD   CS      ONE
1458   REF   4  LAST  335   41,2700  0 2423 C          TC      COMPTEST
1459   REF   2  LAST  335   41,2701  0 2457 C          TC      NOUNTEST      TEST IF NOUN CAN BE LOADED.
1460   REF   2  LAST  335   41,2702  3 3001 C          CAF     VBSP1LD
1461   REF   5  LAST  335   41,2703  0 2336 C          TC      UPDATVB -1
1462   REF   2  LAST  335   41,2704  0 2302 1          TC      REQDATX
1463   REF   2  LAST  335   41,2705  3 3002 C          CAF     VBSP2LD
1464   REF   6  LAST  336   41,2706  0 2336 C          TC      UPDATVB -1
1465   REF   2  LAST  335   41,2707  0 2304 1          TC      REQDATY
1466   REF   6  LAST  316   41,2710  4 4715 1  PUTXY    CS      FIVE          TEST THAT THE 2 DATA WORDS LOADED ARE
1467   REF   2  LAST  335   41,2711  0 3004 C          TC      ALLDEC/CC     ALL DEC OR ALL CCT.
1468                       41,2712  0 0006 1          EXTEND
1469   REF   5  LAST  335   41,2713  3 2114 1          DCA     LODNRLOC      SWITCH BANKS TO NOUN TABLE READING
1470   REF   8  LAST  335   41,2714  52 006 C          DXCH    Z             ROUTINE.
1471   REF  49  LAST  335   41,2715  3 4714 1          CAF     ZERO          X COMP
1472   REF   4  LAST  335   41,2716  0 3070 C          TC      PUTCOM
1473   REF  19  LAST  336   41,2717  50 145 1          INDEX   NOUNADD
1474                       41,2720  54 000 C          TS      0
1475   REF  31  LAST  336   41,2721  3 4712 1          CAF     ONE           Y COMP
1476   REF   5  LAST  336   41,2722  0 3070 C          TC      PUTCOM
1477   REF  20  LAST  336   41,2723  50 145 1          INDEX   NOUNADD
1478                       41,2724  54 001 1          TS      1
1479   REF   4  LAST  336   41,2725  0 2771 1          TC      LOADLV

1481   REF   3  LAST  336   41,2726  0 2302 1  ALOAD    TC      REQDATX
1482                       41,2727  0 0006 1          EXTEND
1483   REF   6  LAST  336   41,2730  3 2114 1          DCA     LODNRLOC      SWITCH BANKS TO NOUN TABLE READING
1484   REF   9  LAST  336   41,2731  52 006 C          DXCH    Z             ROUTINE.
1485   REF  50  LAST  336   41,2732  3 4714 1          CAF     ZERO          X COMP
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1486  REF   6  LAST  336   41,2733  0 3070 C          TC      PUTCOM
1487  REF  21  LAST  336   41,2734  50 145 1          INDEX   NOUNADD
1488                        41,2735  54 000 C          TS      0
1489  REF   5  LAST  336   41,2736  0 2771 1          TC      LOADLV

1490  REF  32  LAST  336   41,2737  4 4712 C  BLOAD   CS      ONE
1491  REF   5  LAST  336   41,2740  0 2423 C          TC      COMPTEST
1493  REF  24  LAST  328   41,2741  3 4674 C          CAF     BIT15       SET CLPASS FOR PASSO ONLY
1494  REF  10  LAST  317   41,2742  55*015 C          TS      CLPASS
1495  REF   3  LAST  336   41,2743  0 2304 1          TC      REQDATY
1496                        41,2744  0 0006 1          EXTEND
1497  REF   7  LAST  336   41,2745  3 2114 1          DCA     LODNNLOC    SWITCH BANKS TO NOUN TABLE READING
1498  REF  10  LAST  336   41,2746  52 006 0          DXCH    Z           ROUTINE.
1499  REF  33  LAST  337   41,2747  3 4712 1          CAF     ONE
1500  REF   7  LAST  337   41,2750  0 3070 C          TC      PUTCOM
1501  REF  22  LAST  337   41,2751  50 145 1          INDEX   NOUNADD
1502                        41,2752  54 001 1          TS      1
1503  REF   6  LAST  337   41,2753  0 2771 1          TC      LOADLV

1504  REF  17  LAST  335   41,2754  4 4711 C  CLOAD   CS      TWO
1505  REF   6  LAST  337   41,2755  0 2423 C          TC      COMPTEST
1507  REF  25  LAST  337   41,2756  3 4674 C          CAF     BIT15       SET CLPASS FOR PASSO ONLY
1508  REF  11  LAST  337   41,2757  55*015 0          TS      CLPASS
1509  REF   3  LAST  335   41,2760  0 2306 C          TC      REQDATZ
1510                        41,2761  0 0006 1          EXTEND
1511  REF   8  LAST  337   41,2762  3 2114 1          DCA     LODNNLOC    SWITCH BANKS TO NOUN TABLE READING
1512  REF  11  LAST  337   41,2763  52 006 C          DXCH    Z           ROUTINE.
1513  REF  18  LAST  337   41,2764  3 4711 1          CAF     TWO
1514  REF   8  LAST  337   41,2765  0 3070 C          TC      PUTCOM
1515  REF  23  LAST  337   41,2766  50 145 1          INDEX   NOUNADD
1516                        41,2767  54 002 1          TS      2
1517  REF   7  LAST  337   41,2770  0 2771 1          TC      LOADLV

1518  REF  51  LAST  336   41,2771  3 4714 1  LOADLV   CAF     ZERO
1519  REF  13  LAST  317   41,2772  55*000 1          TS      DECBRNCH
1520  REF  52  LAST  337   41,2773  4 4714 C          CS      ZERO
1521  REF   1               41,2774  55*014 1          TS      LOADSTAT
1522  REF   6  LAST  321   41,2775  4 4374 1          CS      VD1         TO BLOCK NUMERICAL CHARACTERS AND
1523  REF  37  LAST  334   41,2776  54 777 1          TS      DSPCOUNT    CLEARS AFTER A COMPLETED LOAD
1524  REF  22  LAST  333   41,2777  0 4574 C          TC      POSTJUMP    AFTER COMPLETED LOAD, GO TO RECALTST
1525  REF   1               41,3000   61450 1         CADR    RECALTST    TO SEE IF THERE IS RECALL FROM ENDIDLE.

1526                        41,3001   00025 C  VBSP1LD  DEC     21          VB21 = ALOAD
1527                        41,3002   00026 C  VBSP2LD  DEC     22          VB22 = BLOAD
1528                        41,3003   00027 1  VBSP3LD  DEC     23          VB23 = CLOAD

1529  REF  13  LAST  333   41,3004  54 117 1  ALLOC/OC TS      DECCOUNT    TESTS THAT DATA WORDS LOADED ARE EITHER
1530  REF  14  LAST  337   41,3005  4 1000 1          CS      DECBRNCH    ALL DEC OR ALL OCT. ALARMS IF NOT.
1531  REF   6  LAST  315   41,3006  54 021 C          TS      SR
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1532   REF   7  LAST  337   41,3007  4 0021 C          CS     SR
1533   REF   8  LAST  338   41,3010  4 0021 C          CS     SR          SHIFTED RIGHT 2
1534   REF 101  LAST  332   41,3011  10 000 0          CCS    A           DEC COMP BITS IN LOW 3
1535                        41,3012  1 3014 C          TCF    +2          SOME ONES IN LOW 3
1536   REF  75  LAST  334   41,3013  0 0002 0          TC     Q           ALL ZEROS. ALL OCTAL.  OK
1537   REF  14  LAST  337   41,3014  6 0117 C          AD     DECOUNT     DEC COMP = 7 FOR 3COMP, =6 FOR 2COMP
1538                        41,3015  0 0006 1          EXTEND             (BUT IT HAS BEEN DECREMENTED BY CCS)
1539                        41,3016  1 3020 1          BZF    +2          MUST MATCH 6 FOR 3COMP, 5 FOR 2COMP.
1540   REF   4  LAST  325   41,3017  0 4161 C          TC     ALMCYCLE    ALARM AND RECYCLE.
1541   REF  76  LAST  338   41,3020  0 0002 0  GOQ     TC     Q           ALL REQUIRED ARE DEC. OK

1542   REF  77  LAST  338   41,3021  56 002 C  SFRUTNOR XCH    Q           GETS SF ROUTINE NUMBER FOR NORMAL CASE
1543   REF   1              41,3022  54 114 1          TS     EXITEM      CANT USE L FOR RETURN. TSTFORDP USES L.
1544   REF   1              41,3023  3 4363 C          CAF    MID5
1545   REF   3  LAST  326   41,3024  7 0147 1          MASK   NNTYPTEM
1546   REF   1              41,3025  0 4336 C          TC     RIGHT5
1547   REF   2  LAST  338   41,3026  0 0114 0          TC     EXITEM      SF ROUTINE NUMBER IN A

1548   REF  78  LAST  338   41,3027  56 002 0  SFRUTMIX XCH    Q           GETS SF ROUTINE NUMBER FOR MIXED CASE
1549   REF   3  LAST  338   41,3030  54 114 1          TS     EXITEM
1550   REF  15  LAST  338   41,3031  50 117 0          INDEX  DECOUNT
1551   REF   1              41,3032  3 3061 C          CAF    DISPLACE    PUT TC GOQ, TC RIGHT5, OR TC LEFT5 IN L
1552   REF  36  LAST  326   41,3033  54 001 1          TS     L
1553   REF  16  LAST  338   41,3034  50 117 C          INDEX  DECOUNT
1554   REF   3  LAST  309   41,3035  3 4362 1          CAF    LOW5        LOW5, MID5, OR HI5 IN A
1555   REF   2  LAST  263   41,3036  7 0153 1          MASK   RUTMXTEM    GET HI5, MID5, OR LOW5 OF RUTMXTAB ENTRY
1556   REF  37  LAST  338   41,3037  50 001 C          INDEX  L
1557                        41,3040  0 0000 1          TC     0
R1558  DO TC GOQ(DECOUNT=0), DO TC RIGHT5(DECOUNT=1), DO TC LEFT5(DECOUNT=2).
1559   REF   4  LAST  338   41,3041  0 0114 0  SFRET1  TC     EXITEM      SF ROUTINE NUMBER IN A

1560   REF  79  LAST  338   41,3042  56 002 0  SFCONUM  XCH    Q           GETS 2X( SF CONSTANT NUMBER)
1561   REF   5  LAST  338   41,3043  54 114 1          TS     EXITEM
1562   REF   9  LAST  334   41,3044  50 140 1          INDEX  MIXBR
1563                        41,3045  0 3045 0          TC     +0
1564   REF   1              41,3046  0 3064 C          TC     CONUMNOR    NORMAL NOUN
1565   REF  17  LAST  338   41,3047  50 117 0          INDEX  DECOUNT     MIXED NOUN
1566   REF   2  LAST  338   41,3050  3 3061 C          CAF    DISPLACE
1567   REF  38  LAST  338   41,3051  54 001 1          TS     L           PUT TC GOQ, TC RIGHT5, OR TC LEFT5 IN L
1568   REF  18  LAST  338   41,3052  50 117 0          INDEX  DECOUNT
1569   REF   4  LAST  338   41,3053  3 4362 1          CAF    LOW5
1570   REF   4  LAST  338   41,3054  7 0147 1          MASK   NNTYPTEM
1571   REF  39  LAST  338   41,3055  50 001 C          INDEX  L
1572                        41,3056  0 0000 1          TC     0
R1573  DO TC GOQ(DECOUNT=0), DO TC RIGHT5(DECOUNT=1), DO TC LEFT5(DECOUNT=2).
1574                        41,3057  6 0000 1  SFRET    DOUBLE             2X(SF CONSTANT NUMBER ) IN A
1575   REF   6  LAST  338   41,3060  0 0114 0          TC     EXITEM

1576   REF   1              41,3061  0 3020 0  DISPLACE TC     GOQ
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 1577   REF   2  LAST  338   41,3062  0 4336 0          TC      RIGHTS
 1578   REF   3  LAST  326   41,3063  0 4345 1          TC      LEFTS

 1579   REF   5  LAST  338   41,3064  3 4362 1  CONUMNOR CAF     LOW5          NORMAL NOUN ALWAYS GETS LOW 5 OF
 1580   REF   5  LAST  338   41,3065  7 0147 1          MASK    NNTYPTEM      NNTYPTAB FOR SF CONUM.
 1581                        41,3066  6 0000 1          DOUBLE
 1582   REF   7  LAST  338   41,3067  0 0114 0          TC      EXITEM        2X( SF CONSTANT NUMBER) IN A


 1583   REF  19  LAST  338   41,3070  54 117 1  PUTCOM   TS      DECOUNT
 1584   REF  8C  LAST  338   41,3071  56 002 0          XCH     Q
 1585   REF   1              41,3072  54 115 0          TS      DECRET
 1586   REF  53  LAST  337   41,3073  3 4714 1          CAF     ZERO
 1587   REF   3  LAST  330   41,3074  54 162 0          TS      MPAC+6
 1588   REF  20  LAST  339   41,3075  50 117 0          INDEX   DECOUNT
 1589   REF   3  LAST  315   41,3076  57'006 0          XCH     XREGLP
 1590   REF 121  LAST  334   41,3077  54 155 1          TS      MPAC  +1
 1591   REF  21  LAST  339   41,3100  50 117 0          INDEX   DECOUNT
 1592   REF   5  LAST  336   41,3101  57'003 0          XCH     XREG
 1593   REF 122  LAST  339   41,3102  54 154 0          TS      MPAC
 1594   REF  10  LAST  338   41,3103  50 140 1          INDEX   MIXBR
 1595                        41,3104  0 3104 1          TC      +0
 1596   REF   1              41,3105  0 3132 1          TC      PUTNORM       NORMAL NOUN
R1597   IF MIXNOUN, PLACE ADDRESS FOR COMPONENT K INTO NOUNADD, SET EBANK BITS.
 1598   REF  22  LAST  339   41,3106  50 117 0          INDEX   DECOUNT       GET IOADDTAB ENTRY FOR COMPONENT K
 1599   REF   4  LAST  330   41,3107  3 0150 0          CA      IOADITEM              OF NOUN.
 1600   REF   5  LAST  330   41,3110  7 4372 1          MASK    LOW11         (ECADR)SUBK FOR CURRENT COMP OF NOUN
 1601   REF   6  LAST  336   41,3111  0 4317 0          TC      SETNCADR      ECADR INTO NOUNCADR. SETS EB, NOUNADD.
 1602                        41,3112  0 0006 1          EXTEND                C(NOUNADD) IN A UPON RETURN
 1603   REF  23  LAST  339   41,3113  60 117 0          SU      DECOUNT       PLACE (ESUBK)-K INTO NOUNADD
 1604   REF  24  LAST  337   41,3114  54 145 0          TS      NOUNADD
 1605   REF  15  LAST  337   41,3115  11'000 1          CCS     DECBRNCH
 1606   REF   1              41,3116  0 3165 0          TC      PUTDECSF      +  DEC
 1607   REF   1              41,3117  0 2451 0          TC      DCTSTCYC      +0 OCTAL
 1608   REF   3  LAST  327   41,3120  0 3027 1          TC      SFRUTMIX      TEST IF DEC ONLY BIT = 1. IF SO,
 1609   REF   3  LAST  326   41,3121  0 2261 0          TC      DPTEST        ALARM AND RECYCLE. IF NOT, CONTINUE.
 1610   REF   1              41,3122  0 3150 0          TC      PUTCOM2       NO DP
A1611                                                                        TEST FOR DP SCALE FOR OCT LOAD. IF SO,
A1612                                                                        +0 INTO MAJOR PART. SET NOUNADD FOR
A1613                                                                        LOADING OCTAL WORD INTO MINOR PART.
 1614   REF  25  LAST  339   41,3123  24 145 1  PUTDPCOM INCR    NOUNADD       DP  (ESUBK)-K+1  OR  E+1
 1615   REF  26  LAST  339   41,3124  3 0145 1          CA      NOUNADD       NOUNADD NOW SET FOR MINOR PART
 1616   REF  24  LAST  339   41,3125  26 117 1          ADS     DECOUNT       (ESUBK)+1  OR  E+1  INTO DECOUNT
 1617   REF  54  LAST  339   41,3126  3 4714 1          CAF     ZERO          NOUNADD SET FOR MINOR PART
 1618   REF  25  LAST  339   41,3127  50 117 0          INDEX   DECOUNT
 1619                        41,3130  53'777 0          TS      0       -1    ZERO MAJOR PART(ESUBK OR E)
 1620   REF   2  LAST  339   41,3131  0 3150 0          TC      PUTCOM2

 1621   REF   2  LAST  317   41,3132  0 4325 1  PUTNORM  TC      SETNADD       ECADR FROM NOUNCADR. SETS EB, NOUNADD.
 1622   REF  16  LAST  339   41,3133  11'000 1          CCS     DECBRNCH
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1623   REF   2  LAST  339   41,3134   0 3165 C          TC      PUTDECSF        +  DEC
1624   REF   2  LAST  339   41,3135   0 2451 C          TC      DCTSTCYC        +0 OCTAL
1625   REF   3  LAST  327   41,3136   0 3021 1          TC      SFRUTNOR        TEST IF DEC ONLY BIT = 1. IF SO,
1626   REF   4  LAST  339   41,3137   0 2261 C          TC      DPTEST          ALARM AND RECYCLE. IF NOT, CONTINUE.
1627   REF   3  LAST  339   41,3140   0 3144 C          TC      PUTCOM2 -4      NO DP
1628   REF  59  LAST  339   41,3141   3 4714 1          CAF     ZERO            DP
1629   REF  26  LAST  339   41,3142  54 117 1           TS      DECOUNT
1630   REF   1              41,3143   0 3123 1          TC      PUTDPCOM

1631   REF   8  LAST  326   41,3144   3 0146 1          CA      NNADTEM
1632   REF  34  LAST  337   41,3145   6 4712 1          AD      ONE             IF NNADTEM = -1, CHANNEL TO BE SPECIFIED
1633                        41,3146   0 0006 1          EXTEND
1634   REF   1              41,3147   1 3154 C          BZF     CHANLOAD
1635   REF 123  LAST  339   41,3150  56 154 1  PUTCOM2 XCH     MPAC
1636   REF   2  LAST  339   41,3151   0 0115 1          TC      DECRET

1637   REF  38  LAST  337      0777                     EBANK=  DSPCOUNT
1638   REF   1              41,3152    02126 C  GTSFINLC 2CADR  GTSFIN
1638   REF   1              41,3153    64101 C

1639   REF   6  LAST  339   41,3154   4 4716 1  CHANLOAD CS     SEVEN           DONT LOAD CHAN 7. (IT = SUPERBANK).
16391  REF   4  LAST  326   41,3155   6 1017 C          AD      NOUNCADR
16392                       41,3156   0 0006 1          EXTEND
16393  REF   8  LAST  337   41,3157   1 2771 C          BZF     LOADLV
16394  REF 124  LAST  340   41,3160   3 0154 1          CA      MPAC
1640                        41,3161   0 0006 1          EXTEND
1641   REF   5  LAST  340   41,3162   5 1017 C          INDEX   NOUNCADR
1642                        41,3163   01 000 C          WRITE   0
1643   REF   9  LAST  340   41,3164   0 2771 1          TC      LOADLV

R1644  PUTDECSF FINDS MIXBR AND DECCOUNT STILL SET FROM PUTCOM

1645   REF   2  LAST  326   41,3165   0 3042 1  PUTDECSF TC     SFCONUM         2X(SF CON NUMB) IN A
1646   REF  13  LAST  330   41,3166  54 123 C           TS      SFTEMP1
1647                        41,3167   0 0006 1          EXTEND                  SWITCH BANKS TO SF CONSTANT TABLE
1648   REF   1              41,3170   3 3153 C          DCA     GTSFINLC        READING ROUTINE.
1649   REF  12  LAST  337   41,3171  52 006 C           DXCH    Z               LOADS SFTEMP1, SFTEMP2.
1650   REF  11  LAST  339   41,3172  50 140 1          INDEX   MIXBR
1651                        41,3173   0 3173 1          TC      +0
1652   REF   1              41,3174   0 3177 C          TC      PUTSFNOR
1653   REF   4  LAST  339   41,3175   0 3027 1          TC      SFRUTMIX
1654   REF   1              41,3176   0 3200 C          TC      PUTDCSF2
1655   REF   4  LAST  340   41,3177   0 3021 1  PUTSFNOR TC     SFRUTNOR

1656   REF 102  LAST  338   41,3200  50 000 1  PUTDCSF2 INDEX   A
1657   REF   1              41,3201   3 3203 C          CAF     SFINTABR
1658   REF   3  LAST  327   41,3202   0 4577 C          TC      BANKJUMP        SWITCH BANKS FOR EXPANSHION ROOM
1659   REF   1              41,3203    62347 C  SFINTABR CADR   GOALMCYC        ALARM AND RECYCLE IF DEC LOAD
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A1660                                                                   WITH OCTAL ONLY NOUN.
 1661   REF   1              41,3204   60774 C          CADR   BINRCND
 1662   REF   1              41,3205   60714 C          CADR   DEGINSF
 1663   REF   1              41,3206   60764 1          CADR   ARTHINSF
 1664   REF   1              41,3207   61017 C          CADR   DPINSF
 1665   REF   1              41,3210   61044 C          CADR   DPINSF2
 1666   REF   1              41,3211   61002 1          CADR   OPTDEGIN
 1667   REF   2  LAST  341   41,3212   61017 C          CADR   DPINSF          SAME AS ARITHDP1
 1668   REF   1              41,3213   65365 1          CADR   HMSIN
 1669   REF   4  LAST  334   41,3214   61323 1          CADR   DSPALARM        MIN/SEC CANT BE LOADED.
 1671   REF   1              41,3215   61051 1          CADR   DPINSF4
 16711  REF   1              41,3216   60777 C          CADR   ARTIN1SF
 16712  REF   5  LAST  341   41,3217   61323 1          CADR   DSPALARM        2INTOUT CANT BE LOADED.
 1672                        41,3220             ENDRUTIN EQUALS

R1673   SCALE FACTORS FOR THOSE ROUTINES NEEDING THEM ARE AVAILABLE IN SFTEMP1.
R1674   ALL SFIN ROUTINES USE MPAC MPAC+1. LEAVE RESULT IN A. END WITH TC DECRET

 1675   REF   1              40,2714                    SETLOC ENDDPDEC +1

 16755  REF   4 LAST  334 TC  335:    15   460*        COUNT  40/PIN

R1676   DEGINSF APPLIES 1000/180 =5.55555(10) = 5.43434(8)

 1677   REF   6  LAST  334   40,2714   0 7052 1  DEGINSF  TC     DMP            SF ROUTINE FOR DEC DEGREES
 1678   REF   1              40,2715    02757 C          ADRES  DEGCON1        MULT BY 5.5  5(10)X2EXP-3
 1679   REF 125  LAST  340   40,2716   10 155 1          CCS    MPAC     +1    THIS ROUNDS OFF MPAC+1 BEFORE SHIFT
 1680   REF  15  LAST  313   40,2717   3 4700 1          CAF    BIT11          LEFT 3, AND CAUSES 360.00 TO OF/UF
 1681                        40,2720   0 2722 1          TC     +2             WHEN SHIFTED LEFT AND ALARM.
 1682   REF  16  LAST  341   40,2721   4 4700 C          CS     BIT11
 1683   REF 126  LAST  341   40,2722   6 0155 C          AD     MPAC     +1
 1684   REF   1              40,2723   0 3070 C          TC     2ROUND   +2
 1685   REF   3  LAST  333   40,2724   0 4420 C          TC     TPSL1          LEFT 1
 1686   REF   4  LAST  341   40,2725   0 4420 C  DEGINSF2 TC     TPSL1          LEFT 2
 1687   REF   1              40,2726   0 3077 1          TC     TESTOFUF
 1688   REF   5  LAST  341   40,2727   0 4420 C          TC     TPSL1          RETURNS IF NO OF/UF (LEFT3)
 1689   REF 127  LAST  341   40,2730   10 154 C          CCS    MPAC
 1690   REF   1              40,2731   0 2735 1          TC     SIGNFIX        IF+, GO TO SIGNFIX
 1691   REF   2  LAST  341   40,2732   0 2735 1          TC     SIGNFIX        IF +0, GO TO SIGNFIX
 1692                        40,2733   4 0000 C          COM                   IF - , USE -MAGNITUDE +1
 1693   REF 128  LAST  341   40,2734   54 154 C          TS     MPAC           IF -0, USE +0
 1694   REF   4  LAST  339   40,2735   10 162 C  SIGNFIX  CCS    MPAC+6
 1695   REF   1              40,2736   0 2753 1          TC     SGNTC1         IF OVERFLOW
 1696   REF   1              40,2737   0 2747 1          TC     ENDSCALE       NO OVERFLOW/UNDERFLOW
 1697   REF 129  LAST  341   40,2740   10 154 C          CCS    MPAC           IF UF FORCE SIGN TO 0 EXCEPT -180
 1698   REF   5  LAST  328   40,2741   0 5642 1          TC     CCSHOLE
 1699   REF   1              40,2742   0 2751 C          TC     NEG180
 1700                        40,2743   0 2744 1          TC     +1
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1701   REF 130  LAST 341   40,2744  56 154 1          XCH     MPAC
1702   REF   7  LAST 297   40,2745  7 4672 1          MASK    POSMAX
1703   REF 131  LAST 342   40,2746  54 154 C          TS      MPAC
1704   REF  23  LAST 337   40,2747  0 4574 C  ENDSCALE TC      POSTJUMP
1705   REF   4  LAST 340   40,2750   63150 C          CADR    PUTCOM2

1706   REF   8  LAST 342   40,2751  4 4672 1  NEG180   CS      POSMAX
1707   REF   2  LAST 341   40,2752  0 2746 C          TC      ENDSCALE  -1

1708   REF 132  LAST 342   40,2753  4 0154 C  SGNTO1   CS      MPAC            IF OF FORCE SIGN TO 1
1709   REF   9  LAST 342   40,2754  7 4672 1          MASK    POSMAX
1710   REF 103  LAST 340   40,2755  4 0000 C          CS      A
1711   REF   3  LAST 342   40,2756  0 2746 C          TC      ENDSCALE  -1

1712               40,2757   26161 C  DEGCON1  2DEC    5.555555555 B-3
1712               40,2760   30707 1

1713               40,2761   21616 C  DEGCON2  2DEC    2.222222222 B-2
1713               40,2762   07071 0
1714               40,2763   71527 1  NEG.2     OCT     -06250          = .197753906  I.E. THE BIAS SCALED

1715   REF   7  LAST 341   40,2764  0 7052 1  ARTHINSF TC      DMP             SCALES MPAC, +1 BY SFTEMP1, SFTEMP2.
1716   REF  14  LAST 340   40,2765   00123 1          ADRES   SFTEMP1         ASSUMES POINT BETWEEN HI AND LO PARTS
1717   REF 133  LAST 342   40,2766  56 156 C          XCH     MPAC    +2      OF SFCON. SHIFTS RESULTS LEFT BY 14.
1718   REF 134  LAST 342   40,2767  56 155 C          XCH     MPAC    +1      (BY TAKING RESULTS FROM MPAC+1, MPAC+2)
1719   REF 135  LAST 342   40,2770  56 154 1          XCH     MPAC
1720               40,2771  0 0006 1          EXTEND
1721   REF   2  LAST 341   40,2772  1 2774 C          BZF     BINRCUND
1722   REF   5  LAST 338   40,2773  0 4161 C          TC      ALMCYCLE        TOO LARGE A LOAD. ALARM AND RECYCLE.
1723   REF   2  LAST 341   40,2774  0 3066 1  BINRCUND TC      2ROUND
1724   REF   2  LAST 341   40,2775  0 3077 1          TC      TESTOFUF
1725   REF   4  LAST 342   40,2776  0 2747 1          TC      ENDSCALE        RETURNS IF NO OF/UF


17251  REF   8  LAST 342   40,2777  0 7052 1  ARTINISF TC      DMP             SCALES MPAC, +1 BY SFTEMP1, SFTEMP2.
17252  REF  15  LAST 342   40,3000   00123 1          ADRES   SFTEMP1         ROUNDS MPAC+1 INTO MPAC.
17253  REF   3  LAST 342   40,3001  0 2774 1          TC      BINRCUND


1726   REF 136  LAST 342   40,3002  10 154 C  OPTDEGIN CCS     MPAC            OPTICS SCALING ROUTINE
1727               40,3003  0 3007 C          TC      +4
1728               40,3004  0 3007 C          TC      +3
1729   REF   6  LAST 342   40,3005  0 4161 C          TC      ALMCYCLE        REJECT - INPUT. ALARM AND RECYCLE.
1730   REF   7  LAST 342   40,3006  0 4161 C          TC      ALMCYCLE        REJECT - INPUT. ALARM AND RECYCLE.
1731   REF   1             40,3007  3 2763 1  OPDEGIN2 CAF     NEG.2           RANGE IS 90 DEG
1732   REF 137  LAST 342   40,3010  26 154 C          ADS     MPAC            SUBTRACT BIAS
1733   REF   9  LAST 342   40,3011  0 7052 1          TC      DMP             MULT BY 100 / 45  B-2
1734   REF   1             40,3012   02761 C          ADRES   DEGCON2
1735   REF  17  LAST 294   40,3013  3 4677 0          CAF     BIT12           ROUND AS IN DEGINSF
1736   REF 138  LAST 342   40,3014  6 0155 C          AD      MPAC    +1
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1737  REF   3  LAST  342   40,3015  0 3070 C          TC     2ROUND  +2
1738  REF   1              40,3016  0 2725 C          TC     DEGINSF2

1739  REF  10  LAST  342   40,3017  0 7052 1  DPINSF   TC     DMP             SCALES MPAC, MPAC +1 BY SFTEMP1,
1740  REF  16  LAST  342   40,3020    00123 1          ADRES  SFTEMP1         SFTEMP2.  STORES LOW PART OF RESULT
1741  REF 139  LAST  342   40,3021  56 156 C          XCH    MPAC    +2      IN (E SUBK) +1 OR E+1
1742                       40,3022  6 0000 1          DOUBLE
1743  REF 140  LAST  343   40,3023  54 156 1          TS     MPAC    +2
1744  REF  56  LAST  340   40,3024  3 4714 1          CAF    ZERO
1745  REF 141  LAST  343   40,3025  6 0155 C          AD     MPAC    +1
1746  REF   4  LAST  343   40,3026  0 3070 C          TC     2ROUND  +2
1747  REF   3  LAST  342   40,3027  0 3077 1          TC     TESTOFUF
1748  REF  12  LAST  340   40,3030  50 140 1          INDEX  MIXBR           RETURNS IF NO OF/UF
1749                       40,3031  0 3031 C          TC     +0
1750  REF   1              40,3032  0 3042 1          TC     DPINORM
1751  REF  27  LAST  340   40,3033  3 0117 0          CA     DECOUNT         MIXEDNOUN
1752  REF  27  LAST  339   40,3034  6 0145 1  DPINCOM  AD     NOUNADD             MIXED                NORMAL
1753  REF  81  LAST  339   40,3035  54 002 1          TS     Q                 E SUBK               E
1754  REF 142  LAST  343   40,3036  56 155 C          XCH    MPAC    +1
1755  REF  82  LAST  343   40,3037  50 002 C          INDEX  Q
1756                       40,3040  54 001 1          TS     1               PLACE LOW PART IN
1757  REF   5  LAST  342   40,3041  0 2747 1          TC     ENDSCALE        (E SUBK) +1    MIXED
1758  REF  57  LAST  343   40,3042  3 4714 1  DPINORM  CAF    ZERO            E +1           NORMAL
1759  REF   1              40,3043  0 3034 C          TC     DPINCOM

1760  REF  11  LAST  343   40,3044  0 7052 1  DPINSF2  TC     DMP             ASSUMES POINT BETWEEN BITS 7-8 OF HIGH
1761  REF  17  LAST  343   40,3045    00123 1          ADRES  SFTEMP1         PART OF SF CONST. DPINSF2 SHIFTS RESULTS
1762  REF  14  LAST  339   40,3046  3 6211 C          CAF    SIX             LEFT BY 7, ROUNDS MPAC+2 INTO MPAC+1
1763  REF   2  LAST  329   40,3047  0 3056 1          TC     TPLEFTN         SHIFT LEFT 7.
1764  REF   3  LAST  341   40,3050  0 3021 1          TC     DPINSF  +2

1765  REF  12  LAST  343   40,3051  0 7052 1  DPINSF4  TC     DMP             ASSUMES POINT BETWEEN BITS 11-12 OF HIGH
1766  REF  18  LAST  343   40,3052    00123 1          ADRES  SFTEMP1         PART OF SF CONST. DPINSF2 SHIFTS RESULTS
1767  REF  19  LAST  337   40,3053  3 4711 1          CAF    TWO             LEFT BY 3, ROUNDS MPAC+2 INTO MPAC+1.
1768  REF   3  LAST  343   40,3054  0 3056 1          TC     TPLEFTN         SHIFT LEFT 3.
1769  REF   4  LAST  343   40,3055  0 3021 1          TC     DPINSF  +2

1770  REF  83  LAST  343   40,3056  56 002 C  TPLEFTN  XCH    Q               SHIFTS MPAC, +1, +2 LEFT N. SETS OVFIND
1771  REF   1              40,3057  54 124 1          TS     SFTEMP2         TO +1 FOR OF, -1 FOR UF.
1772  REF  84  LAST  343   40,3060  56 002 C          XCH    Q               CALL WITH N-1 IN A.
1773  REF  19  LAST  343   40,3061  54 123 C  LEFTNCOM TS     SFTEMP1             LOOP TIME .37 MSEC.
1774  REF   6  LAST  341   40,3062  0 4420 C          TC     TPSL1
1775  REF  20  LAST  343   40,3063  10 123 C          CCS    SFTEMP1
1776  REF   1              40,3064  0 3061 C          TC     LEFTNCOM
1777  REF   2  LAST  343   40,3065  0 0124 C          TC     SFTEMP2
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1778   REF 143  LAST  343   40,3066  56 155 C  2ROUND   XCH     MPAC     +1
1779                        40,3067  6 0000 1            DOUBLE
1780   REF 144  LAST  344   40,3070  54 155 1            TS      MPAC     +1
1781   REF  85  LAST  343   40,3071  0 0002 C            TC      Q                IF MPAC+1 DOES NOT OF/UF
1782   REF 145  LAST  344   40,3072  6 0154 1            AD      MPAC
1783   REF 146  LAST  344   40,3073  54 154 C            TS      MPAC
1784   REF  86  LAST  344   40,3074  0 0002 C            TC      Q                IF MPAC DOES NOT OF/UF
1785   REF   5  LAST  341   40,3075  54 162 C            TS      MPAC+6
1786   REF  87  LAST  344   40,3076  0 0002 C  2RNDEND  TC      Q


1787   REF   6  LAST  344   40,3077  10 162 0  TESTOFUF CCS     MPAC+6           RETURNS IF NO OF/UF
1788   REF   8  LAST  342   40,3100  0 4161 C            TC      ALMCYCLE         OF   ALARM AND RECYCLE.
1789   REF  88  LAST  344   40,3101  0 0002 C            TC      Q
1790   REF   9  LAST  344   40,3102  0 4161 C            TC      ALMCYCLE         UF   ALARM AND RECYCLE.


1791   REF   1              42,3365                     SETLOC  ENDSPMIN +1

17915  REF   2 LAST  331 TO  334:   146   146*          COUNT   42/PIN

1792   REF   1              42,3365  0 3506 1  HMSIN    TC      ALL3DEC          IF ALL 3 WORDS WERE NOT LOADED, ALARM.
1793   REF  13  LAST  343   42,3366  0 7052 1            TC      DMP              XREG, XREGLP (=HOURS) WERE ALREADY PUT
1794   REF   1              42,3367   03447 C            ADRES   WHOLECON         INTO MPAC, MPAC+1.
1795   REF   1              42,3370  0 3456 C            TC      RND/TST          ROUND OFF TO WHOLE HRS IN MPAC+1.
1796   REF  58  LAST  343   42,3371  3 4714 1            CAF     ZERO             ALARM IF MPAC NON ZERO (G/ 16383 ).
1797   REF 147  LAST  344   42,3372  54 156 1            TS      MPAC     +2
1798   REF   1              42,3373  3 3451 1            CAF     HRCON
1799   REF 148  LAST  344   42,3374  54 154 C            TS      MPAC
1800   REF   2  LAST  344   42,3375  3 3452 1            CAF     HRCON    +1
1801   REF 149  LAST  344   42,3376  56 155 C            XCH     MPAC     +1
1802   REF   6  LAST  332   42,3377  0 7256 1            TC      SHORTMP
1803   REF   1              42,3400  0 3467 1            TC      MPACTST          ALARM IF MPAC NON ZERO (G/ 745)
1804   REF 150  LAST  344   42,3401  52 156 1            DXCH    MPAC     +1      STORE HOURS CONTRIBUTION
1805   REF   1              42,3402  52 124 1            DXCH    HITEMIN
1806   REF   3  LAST  336   42,3403  3 1004 1            CA      YREG             PUT YREG, YREGLP INTO MPAC, +1.
1807   REF   2  LAST   72   42,3404  23*007 1            LXCH    YREGLP
1808   REF 151  LAST  344   42,3405  52 155 1            DXCH    MPAC
1809   REF  14  LAST  344   42,3406  0 7052 1            TC      DMP
1810   REF   2  LAST  344   42,3407   03447 C            ADRES   WHOLECON
1811   REF   2  LAST  344   42,3410  0 3456 C            TC      RND/TST          ROUND OFF TO WHOLE MIN IN MPAC+1
1812   REF   1              42,3411  4 3454 C            CS      59MIN            ALARM IF MPAC NON ZERO (G/16383)
1813   REF   1              42,3412  0 3474 C            TC      SIZETST          ALARM IF MPAC+1 G/ 59MIN
1814   REF 152  LAST  344   42,3413  56 155 C            XCH     MPAC     +1
1815                        42,3414  0 0006 1            EXTEND
1816   REF   1              42,3415  7 3453 1            MP      MINCON           LEAVES MINUTES CONTRIBUTION IN A,L
1817   REF   2  LAST  344   42,3416  20 124 1            DAS     HITEMIN          ADD IN MINUTES CONTRIBUTION
1818                        42,3417  0 0006 1            EXTEND                   IF THIS DAS OVERFLOWS, G/ 745HR,39MIN
1819                        42,3420  1 3422 1            BZF     +2
1820   REF  10  LAST  344   42,3421  0 4161 C            TC      ALMCYCLE
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1821  REF   3  LAST  336   42,3422  3 1005 C          CA      ZREG            PUT ZREG, ZREGLP INTO MPAC, +1.
1822  REF   2  LAST   72   42,3423  23'010 1          LXCH    ZREGLP
1823  REF 153  LAST  344   42,3424  52 155 1          DXCH    MPAC
1824  REF  15  LAST  344   42,3425  0 7052 1          TC      DMP
1825  REF   3  LAST  344   42,3426   03447 C          ADRES   WHOLECON
1826  REF   3  LAST  344   42,3427  0 3456 C          TC      RND/TST         ROUND OFF TO WHOLE CENTI-SEC IN MPAC+1
1827  REF   1               42,3430  4 3455 1          CS      59.99SEC        ALARM IF MPAC NON ZERO (G/163.83 SEC)
1828  REF   2  LAST  344   42,3431  0 3474 C          TC      SIZETST         ALARM IF MPAC+1 G/59.99 SEC
1829  REF   3  LAST  344   42,3432  52 124 1          DXCH    HITEMIN         ADD IN SECONDS CONTRIBUTION
1830  REF 154  LAST  345   42,3433  20 155 1          DAS     MPAC            IF THIS DAS OVERFLOWS,
1831                       42,3434  0 0006 1          EXTEND                  G/ 745 HR, 39 MIN, 14.55 SEC.
1832                       42,3435  1 3437 C          BZF     +2
1833  REF  11  LAST  344   42,3436  0 4161 C          TC      ALMCYCLE        ALARM AND RECYCLE
1834  REF  59  LAST  344   42,3437  3 4714 1          CAF     ZERO
1835  REF 155  LAST  345   42,3440  54 156 1          TS      MPAC    +2
1836  REF   6  LAST  334   42,3441  0 7226 C          TC      TPAGREE
1837  REF 156  LAST  345   42,3442  52 155 1          DXCH    MPAC
1838  REF  28  LAST  343   42,3443  50 145 1          INDEX   NOUNADD
1839                       42,3444  52 001 1          DXCH    0
1840  REF  24  LAST  342   42,3445  0 4574 C          TC      POSTJUMP
1841  REF  10  LAST  340   42,3446   62771 1          CADR    LOADLV

1842                       42,3447   00006 1  WHOLECON OCT     00006           (10EXP5/2EXP14)2EXP14
1843                       42,3450   03240 1           OCT     03240
1844                       42,3451   00025 C  HRCON    OCT     00025           1 HOUR IN CENTI-SEC
1845                       42,3452   37100 1           OCT     37100
1846                       42,3453   13560 C  MINCON   OCT     13560           1 MINUTE IN CENTI-SEC
1847                       42,3454   00073 C  59MIN    OCT     00073           59 AS WHOLE
1848                       42,3455   13557 1  59.99SEC OCT     13557           5999 CENTI-SEC

1849  REF 157  LAST  345   42,3456  56 156 0  RND/TST  XCH     MPAC    +2      ROUNDS MPAC+2 INTO MPAC+1.
1850                       42,3457  6 0000 1           DOUBLE                  ALARMS IF MPAC NOT 0
1851  REF 158  LAST  345   42,3460  54 156 1          TS      MPAC    +2
1852  REF  60  LAST  345   42,3461  3 4714 1          CAF     ZERO
1853  REF 159  LAST  345   42,3462  6 0155 C          AD      MPAC    +1
1854  REF 160  LAST  345   42,3463  54 155 1          TS      MPAC    +1
1855  REF  61  LAST  345   42,3464  3 4714 1          CAF     ZERO
1856  REF 161  LAST  345   42,3465  6 0154 1          AD      MPAC            CANT OVFLOW
1857  REF 162  LAST  345   42,3466  56 154 1          XCH     MPAC
1858  REF 163  LAST  345   42,3467  10 154 C  MPACTST  CCS     MPAC            ALARM IF MPAC NON ZERO
1859  REF  12  LAST  345   42,3470  0 4161 C          TC      ALMCYCLE        ALARM AND RECYCLE.
1860  REF  69  LAST  344   42,3471  0 0002 C          TC      Q
1861  REF  13  LAST  345   42,3472  0 4161 C          TC      ALMCYCLE        ALARM AND RECYCLE.
1862  REF  90  LAST  345   42,3473  0 0002 0          TC      Q

1863  REF 164  LAST  345   42,3474  54 156 1  SIZETST  TS      MPAC    +2      CALLED WITH - CON IN A
1864  REF 165  LAST  345   42,3475  10 155 1          CCS     MPAC    +1      GET MAG OF MPAC+1
1865  REF  35  LAST  340   42,3476  6 4712 1          AD      ONE
1866                       42,3477  1 3501 1          TCF     +2
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 1867   REF  36  LAST  345   42,3500  6 4712 1          AD      ONE
 1868   REF 166  LAST  345   42,3501  6 0156 0          AD      MPAC    +2
 1869                        42,3502  0 0006 1          EXTEND                  MAG OF MPAC+1 - CON
 1870                        42,3503  6 3505 1          BZMF    +2
 1871   REF  14  LAST  345   42,3504  0 4161 0          TC      ALMCYCLE        MAG OF MPAC+1 G/ CON. ALARM AND RECYCLE.
 1872   REF  91  LAST  345   42,3505  0 0002 0          TC      Q               MAG OF MPAC+1 L/= CON


R1873   ALL3DEC TESTS THAT ALL 3 WORDS ARE LOADED IN DEC (FOR HMSIN).
R1874   ALARM IF NOT.( TEST THAT BITS 3,4,5 OF DECBRNCH ARE ALL = 1)
 1875   REF   1                 42,3506  4 3513 1  ALL3DEC  CS      OCT34BAR        GET BITS 3,4,5 IN A
 1876   REF  17  LAST  339      42,3507  7 1000 1            MASK    DECBRNCH        GET BITS 3,4,5 OF DECBRNCH IN A
 1877   REF   2  LAST  346      42,3510  6 3513 0            AD      OCT34BAR        BITS 3,4,5 OF DECBRNCH MUST ALL = 1
 1878   REF 104  LAST  342      42,3511  10 000 0            CCS     A
 1879   REF   1                 42,3512  0 3516 0            TC      FORCEV25
 1880                           42,3513   77743 1  OCT34BAR OCT     77743
 1881   REF   2  LAST  346      42,3514  0 3516 0            TC      FORCEV25
 1882   REF  92  LAST  346      42,3515  0 0002 0            TC      Q


 18825  REF   1                 42,3516  4 4113 1  FORCEV25 CS      OCT31           FORCE VERB 25 TO BE EXECUTED BY RECYCLE
 18826  REF   2  LAST  317      42,3517  55'041 1            TS      VERBSAVE         IN CASE OPERATOR EXECUTED A LOWER LOAD
 18827  REF  15  LAST  346      42,3520  0 4161 0            TC      ALMCYCLE         VERB.  ALARM AND RECYCLE.
 1883                           42,3521           ENDHMSS  EQUALS
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R1884   MONITOR ALLOWS OTHER KEYBOARD ACTIVITY. IT IS ENDED BY VERB TERMINATE,
R1885   VERB PROCEED WITHOUT DATA, VERB RESEQUENCE,
R1886   ANOTHER MONITOR, OR ANY NVSUB CALL THAT PASSES THE DSPLOCK (PROVIDED
R18861  THAT THE OPERATOR HAS SOMEHOW ALLOWED THE ENDING OF A MONITOR WHICH
R18862  HE HAS INITIATED THROUGH THE KEYBOARD).

R1887   MONITOR ACTION IS SUSPENDED, BUT NOT ENDED, BY ANY KEYBOARD ACTION,
R1888   EXCEPT ERROR LIGHT RESET. IT BEGINS AGAIN WHEN KEY RELEASE IS PERFORMED.
R1889   MONITOR SAVES THE NOUN AND APPROPRIATE DISPLAY VERB IN MONSAVE. IT SAVES
R1890   NOUNCADR IN MONSAVE1, IF NOUN = MACHINE CADR TO BE SPECIFIED. BIT 15 OF
R1891   MONSAVE1 IS THE KILL MONITOR SIGNAL (KILLER BIT). BIT 14 OF MONSAVE1
R18911  INDICATES THE CURRENT MONITOR WAS EXTERNALLY INITIATED (EXTERNAL
R18912  MONITOR BIT). IT IS TURNED OFF BY RELDSP AND KILMONON.

R1892   MONSAVE INDICATES IF MONITOR IS ON(+=ON, +0=OFF)
R1893   IF MONSAVE IS +, MONITOR ENTERS NO REQUEST, BUT TURNS KILLER BIT OFF.
R1894   IF MONSAVE IS +0, MONITOR ENTERS REQUEST AND TURNS KILLER BIT OFF.

R1895   NVSUB (IF EXTERNAL MONITOR BIT IS OFF), V8=PROCEED WITHOUT DATA,
R1896   V8=RESEQUENCE, AND V8=TERMINATE TURN KILL MONITOR BIT ON.

R1897   IF KILLER BIT IS ON, MONREQ ENTERS NO FURTHER REQUESTS, ZEROS MONSAVE
R1898   AND MONSAVE1 (TURNING OFF KILLER BIT AND EXTERNAL MONITOR BIT).

R1899   MONITOR CONSENT TEST FOR MATBS SINCE NVSUB CAN HANDLE INTERNAL MATBS NOW
 1900   REF   1                41,3220                      SETLOC ENDRUTIN

 19005  REF   3 LAST  335 TO  341:   262   656*            COUNT  41/PIN

 1901   REF   1                41,3220  4 3227 1  MONITOR  CS     BIT15/14
 1902   REF   6  LAST  340     41,3221  7 1017 1           MASK   NOUNCADR
 1903   REF 167  LAST  346     41,3222  54 155 1  MONIT1   TS     MPAC    +1      TEMP STORAGE
 19031  REF   7  LAST  334     41,3223  4 0136 1           CS     ENTEXIT
 19032  REF   4  LAST  317     41,3224  6 4233 1           AD     ENDINST
 19033  REF 105  LAST  346     41,3225  10 000 0           CCS    A
 19034  REF   1                41,3226  0 3235 0           TC     MONIT2
 19035                          41,3227   60000 1  BIT15/14 OCT    60000
 19036  REF   2  LAST  347     41,3230  0 3235 0           TC     MONIT2
 19037  REF  27  LAST  325     41,3231  3 4675 1           CAF    BIT14           EXTERNALLY INITIATED MONITOR,
 19038  REF 168  LAST  347     41,3232  26 155 1           ADS    MPAC +1         SET BIT 14 FOR MONSAVE1.
 190381 REF  62  LAST  345     41,3233  3 4714 1           CAF    ZERO
 190382 REF   1                41,3234  55*022 1           TS     MONSAVE2        ZERO NVMONOPT OPTIONS
 1904   REF   3  LAST  197     41,3235  3 6043 0  MONIT2    CAF    LOW7
 1905   REF  17  LAST  324     41,3236  7 1001 0           MASK   VERBREG
 1906   REF   4  LAST  339     41,3237  0 4345 1           TC     LEFT5
 1907   REF   5  LAST  310     41,3240  54 022 0           TS     CYL
 1908   REF   6  LAST  347     41,3241  4 0022 0           CS     CYL
 1909   REF   7  LAST  347     41,3242  56 022 1           XCH    CYL
 1910   REF  11  LAST  335     41,3243  6 1002 1           AD     NOUNREG
 1911   REF 169  LAST  347     41,3244  54 154 0           TS     MPAC            TEMP STORAGE
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1912  REF  63  LAST  347   41,3245  3 4714 1          CAF     ZERO
1913  REF   3  LAST  308   41,3246  55*012 1          TS      DSPLOCK         +0 INTO DSPLOCK SO MONITOR CAN RUN.
1914  REF   4  LAST  317   41,3247  11*042 1          CCS     CADRSTOR        TURN OFF KR LITE IF CADRSTOR AND DSPLIST
1915                       41,3250  0 3252 1          TC      +2              ARE BOTH EMPTY. (LITE COMES ON IF NEW
1916  REF   1               41,3251  0 4516 1          TC      RELDSP1         MONITOR IS KEYED IN OVER OLD MONITOR.)
1917                       41,3252  0 0004 0          INHINT
1918  REF   2  LAST  187   41,3253  11*020 0          CCS     MONSAVE
1919                       41,3254  0 3261 1          TC      +5              IF MONSAVE WAS +, NO REQUEST
1920  REF  37  LAST  346   41,3255  3 4712 1          CAF     ONE             IF MONSAVE WAS 0, REQUEST MONREQ
1921  REF  10  LAST  242   41,3256  0 5140 1          TC      WAITLIST
1922  REF  39  LAST  340     0777                    EBANK=  DSPCOUNT
1923  REF   1               41,3257   03265 0         2CADR   MONREQ
1923  REF   1               41,3260   62101 0
1924  REF 170  LAST  347   41,3261  52 155 1          DXCH    MPAC            PLACE MONITOR VERB AND NOUN INTO MONSAVE
1925  REF   3  LAST  348   41,3262  53*021 1          DXCH    MONSAVE         ZERO THE KILL MONITOR BIT
1926                       41,3263  0 0003 1          RELINT                  SET UP EXTERNAL MONITOR BIT
1927  REF   4  LAST  316   41,3264  0 0136 0          TC      ENTRET


1928  REF   1               41,3265  0 4414 1  MONREQ  TC      LODSAMPT        CALLED BY WAITLIST
1929  REF   2  LAST  187   41,3266  11*021 1          CCS     MONSAVE1        TIME IS SNATCHED IN RUPT FOR NOUN 65
1930                       41,3267  0 3273 1          TC      +4              IF KILLER BIT = 0, ENTER REQUESTS
1931                       41,3270  0 3273 1          TC      +3              IF KILLER BIT = 0, ENTER REQUESTS
1932  REF   1               41,3271  0 3304 0          TC      KILLMON         IF KILLER BIT = 1, NO REQUESTS
1933  REF   2  LAST  348   41,3272  0 3304 0          TC      KILLMON         IF KILLER BIT = 1, NO REQUESTS
1934  REF   1               41,3273  3 3310 0          CAF     MONDEL
1935  REF  11  LAST  348   41,3274  0 5140 1          TC      WAITLIST        ENTER WAITLIST REQUEST FOR MONREQ
1936  REF  40  LAST  348     0777                    EBANK=  DSPCOUNT
1937  REF   2  LAST  348   41,3275   03265 0         2CADR   MONREQ
1937                       41,3276   62101 0
1938  REF   2  LAST  131   41,3277  3 4371 0          CAF     CHRPRIO
1939  REF  11  LAST  294   41,3300  0 5027 1          TC      NOVAC           ENTER EXEC REQUEST FOR MONDO
1940  REF  41  LAST  348     0777                    EBANK=  DSPCOUNT
1941  REF   1               41,3301   03311 1         2CADR   MONDO
1941  REF   1               41,3302   62101 0
1942  REF  12  LAST  243   41,3303  0 5213 1          TC      TASKOVER

1943  REF  64  LAST  348   41,3304  3 4714 1  KILLMON CAF     ZERO            ZERO MONSAVE AND TURN KILLER BIT OFF
1944  REF   4  LAST  348   41,3305  55*020 0          TS      MONSAVE
1945  REF   3  LAST  348   41,3306  55*021 1          TS      MONSAVE1        TURN OFF KILL MONITOR BIT.
1946  REF  13  LAST  348   41,3307  0 5213 1          TC      TASKOVER        TURN OFF EXTERNAL MONITOR BIT.
1947                       41,3310   00144 0  MONDEL  OCT     144             FOR 1 SEC MONITOR INTERVALS


1948  REF   4  LAST  348   41,3311  11*021 1  MONDO   CCS     MONSAVE1        CALLED BY EXEC
1949                       41,3312  0 3316 0          TC      +4              IF KILLER BIT = 0, CONTINUE
1950                       41,3313  0 3316 0          TC      +3              IF KILLER BIT = 0, CONTINUE
1951  REF  31  LAST  314   41,3314  0 5112 0          TC      ENDOFJOB        IN CASE TERMINATE CAME SINCE LAST MONREQ
1952  REF  32  LAST  348   41,3315  0 5112 0          TC      ENDOFJOB        IN CASE TERMINATE CAME SINCE LAST MONREQ
1953  REF   4  LAST  348   41,3316  11*012 1          CCS     DSPLOCK
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1954   REF    1                41,3317   0 3341 1            TC      MONBUSY         NVSUB IS BUSY
1955   REF    4  LAST  347      41,3320   3 6043 C            CAF     LOW7
1956   REF    5  LAST  348      41,3321   7 1020 C            MASK    MONSAVE
1958   REF    1                41,3322   0 2316 1            TC      UPDATNN -1      PLACE NOUN INTO NOUNREG AND DISPLAY IT
1960   REF    1                41,3323   3 4160 1            CAF     MID7
1961   REF    6  LAST  349      41,3324   7 1020 C            MASK    MONSAVE         CHANGE MONITOR VERB TO DISPLAY VERB
1962   REF    1                41,3325   6 3337 C            AD      MONREF          -DEC10, STARTING IN BIT8
1963   REF    1                41,3326   54 023 1            TS      EDOP            RIGHT 7
1964   REF    2  LAST  349      41,3327   3 0023 C            CA      EDOP
1965   REF   18  LAST  347      41,3330   55'001 C            TS      VERBREG
1966   REF    1                41,3331   3 3340 C            CAF     MONBACK         SET RETURN TO PASTEVB AFTER DATA DISPLAY
1967   REF    5  LAST  348      41,3332   54 136 1            TS      ENTRET
1968   REF    2  LAST  347      41,3333   4 3227 1            CS      BIT15/14
1969   REF    5  LAST  348      41,3334   7 1021 1            MASK    MONSAVE1        PUT ECADR INTO MPAC +2. INTMCTBS WILL
1970   REF  171  LAST  348      41,3335   54 156 1            TS      MPAC    +2      DISPLAY IT AND SET NOUNCADR, NOUNADD,
1971   REF    1                41,3336   0 2046 1  ENDMONDO  TC      TESTNN          EBANK.

1972                             4140                        BLOCK   2

197201 REF    1                 4000                        SETLOC  FFTAG8
1972C2                          4140                        BANK

19725  REF    1                                             COUNT   02/PIN

1973   REF    2  LAST  349       4140   3 4160 1  PASTEVB   CAF     MID7
1974   REF    2  LAST  347       4141   7 1022 1            MASK    MONSAVE2        NVMONOPT PASTE OPTION
1975                            4142   0 0006 1            EXTEND
1976                            4143   1 4145 1            BZF     +2
1977   REF    1                4144   0 4146 C            TC      PASTEOPT        PASTE PLEASE VERB FOR NVMONOPT
1978   REF    7  LAST  349      4145   3 1020 1            CA      MONSAVE         PASTE MONITOR VERB - PASTE OPTION IS 0
19782  REF    3  LAST  349      4146   54 023 1  PASTEOPT  TS      EDOP            RIGHT 7
19783  REF    4  LAST  349      4147   3 0023 C            CA      EDOP            PLACE MONITOR VERB OR PLEASE VERB INTO
197832 REF   49  LAST  333      4150   0 4555 C            TC      BANKCALL         VERBREG AND DISPLAY IT.
197833 REF    7  LAST  336      4151    62336 C            CADR    UPDATVB -1
197835 REF   65  LAST  348      4152   3 4714 1            CAF     ZERO            ZERO REQRET SO THAT PASTED VERBS CAN
197838 REF   10  LAST  321      4153   55'013 C            TS      REQRET           BE EXECUTED BY OPERATOR.
19784  REF    3  LAST  349      4154   3 1022 C            CA      MONSAVE2
19785  REF    1                4155   0 4271 1            TC      BLANKSUB        PROCESS NVMONOPT BLANK OPTION IF ANY
19786                           4156   0 4157 C            TC      +1
19787  REF   33  LAST  348      4157   0 5112 C  ENDPASTE  TC      ENDOFJOB

1979                            4160    37600 C  MID7      OCT     37600

1980   REF    1                41,3337                     SETLOC  ENDMONDO +1
19805  REF    4 LAST  347 TC  349:    79    735*          COUNT   41/PIN

1981                           41,3337    75377 C  MONREF    OCT     75377           -DEC10, STARTING IN BIT8
1982   REF    1                41,3340    04140 C  MONBACK   ADRES   PASTEVB
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 1983   REF   2  LAST  308   41,3341  0 4410 C  MONBUSY  TC     RELDSPON        TURN KEY RELEASE LIGHT
 1984   REF  34  LAST  349   41,3342  0 5112 C           TC     ENDOFJOB


R1985   DSPFMEM IS USED TO DISPLAY (IN OCTAL) ANY FIXED REGISTER.
R1986   IT IS USED WITH NOUN = MACHINE CADR TO BE SPECIFIED. THE FCADR OF THE
R1987   DESIRED LOCATION IS THEN PUNCHED IN. IT HANDLES F/F ( FCADR 4000-7777)

R19871  FOR BANKS L/E 27, THIS IS ENOUGH.

R19872  FOR BANKS G/E 30, THE THIRD COMPONENT OF NOUN 26 (PRIO, ADRES, BBCON)
R19873  MUST BE PRELOADED WITH THE DESIRED SUPERBANK BITS (BITS 5,6,7).
R19874          V23N26 SHOULD BE USED.

R19875  SUMMARY
R19876  FOR BANKS L/E 27,                          V27N01E(FCADR)E
R19877  FOR BANKS G/E 30,    V23N26E(SUPERBITS)E   V27N01E(FCADR)E

 1988   REF  12  LAST  334   41,3343  3 4333 C  DSPFMEM  CAF    R1D1            IF F/F, DATACALL USES BANK 02 OR 03.
 1989   REF  42  LAST  348   41,3344  54 777 1           TS     DSPCOUNT
 19891  REF  15  LAST  275   41,3345  3 1047 C           CA     DSPTEM1 +2      SUPERBANK BITS WERE PRELOADED INTO
 19892  REF  40  LAST  338   41,3346  54 001 1           TS     L               3RD COMPONENT OF NOUN 26.
 1990   REF   7  LAST  347   41,3347  3 1017 C           CA     NOUNCADR        ORIGINAL FCADR LOADED STILL IN NOUNCADR.
 1991   REF   1               41,3350  0 4610 1           TC     SUPDACAL        CALL WITH FCADR IN A, SUPERBITS IN L.
 1992   REF   3  LAST  324   41,3351  0 3353 1           TC     DSPOCTWD
 1993   REF  35  LAST  350   41,3352  0 5112 C  ENDSPF    TC     ENDOFJOB
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P1994 WORD DISPLAY ROUTINES

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 1995   REF    4  LAST  343   40,3103                        SETLOC TESTOFUF +4
 19955  REF    5 LAST  341 TC  344:   119   579*             COUNT  40/PIN

 1996   REF   93  LAST  346   40,3103  56 002 C  DSPSIGN     XCH    Q
 1997   REF    1               40,3104  54 144 1            TS     DSPWDRET
 1998   REF  172  LAST  349   40,3105  10 154 C            CCS    MPAC
 1999                         40,3106  0 3116 1            TC     +8D
 2000                         40,3107  0 3116 1            TC     +7
 2001   REF   38  LAST  348   40,3110  6 4712 1            AD     ONE
 2002   REF  173  LAST  351   40,3111  54 154 C            TS     MPAC
 2003   REF    2  LAST  312   40,3112  0 2334 1            TC     -ON
 2004   REF  174  LAST  351   40,3113  4 0155 1            CS     MPAC  +1
 2005   REF  175  LAST  351   40,3114  54 155 1            TS     MPAC    +1
 2006   REF    2  LAST  351   40,3115  0 0144 C            TC     DSPWDRET
 2007   REF    3  LAST  330   40,3116  0 2314 C            TC     +ON
 2008   REF    3  LAST  351   40,3117  0 0144 C            TC     DSPWDRET

 2009                         40,3120  0 0006 1  DSPRND     EXTEND                 ROUND BY 5 EXP-6
 2010   REF    1               40,3121  3 3164 1            DCA    DECROUND -1
 2011   REF  176  LAST  351   40,3122  20 155 1            DAS    MPAC
 2012                         40,3123  0 0006 1            EXTEND
 2013                         40,3124  1 3130 1            BZF    +4
 2014                         40,3125  0 0006 1            EXTEND
 2015   REF    1               40,3126  3 4672 C            DCA    DPOSMAX
 2016   REF  177  LAST  351   40,3127  52 155 1            DXCH   MPAC
 2017   REF   94  LAST  351   40,3130  0 0002 C            TC     Q

R2018   DSPDECWD CONVERTS C( MPAC, MPAC+1) INTO A SIGN AND 5 CHAR DECIMAL
R2019   STARTING IN LOC SPECIFIED IN DSPCOUNT. IT ROUNDS BY 5 EXP-6.

 2020   REF   95  LAST  351   40,3131  56 002 C  DSPDECWD  XCH    Q
 2021   REF    1               40,3132  54 115 C            TS     WDRET
 2022   REF    1               40,3133  0 3103 C            TC     DSPSIGN
 2023   REF    1               40,3134  0 3120 1            TC     DSPRND
 2024   REF    4  LAST  296   40,3135  3 4710 C            CAF    FOUR
 2025   REF    1               40,3136  54 137 C  DSPDCWD1  TS     WDCNT
 2026   REF    1               40,3137  3 4377 C            CAF    BINCON
 2027   REF    7  LAST  344   40,3140  0 7256 1            TC     SHORTMP
 2028   REF  178  LAST  351   40,3141  50 154 1  TRACE1     INDEX  MPAC
 2029   REF    3  LAST  309   40,3142  3 4072 C            CAF    RELTAB
 2030   REF    6  LAST  339   40,3143  7 4362 C            MASK   LOW5
 2031   REF    6  LAST  332   40,3144  54 124 1            TS     CODE
 2032   REF   66  LAST  349   40,3145  3 4714 1            CAF    ZERO
 2033   REF  179  LAST  351   40,3146  56 156 C            XCH    MPAC    +2
 2034   REF  180  LAST  351   40,3147  56 155 C            XCH    MPAC    +1
 2035   REF  181  LAST  351   40,3150  54 154 C            TS     MPAC
 2036   REF   43  LAST  350   40,3151  56 777 C            XCH    DSPCOUNT
 2037   REF    4  LAST  332   40,3152  54 143 C  TRACE1S    TS     COUNT
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 2038   REF 106  LAST  347   40,3153  10 000 C            CCS     A              DECREMENT DSPCOUNT EXCEPT AT +0
 2039   REF  44  LAST  351   40,3154  54 777 1            TS      DSPCOUNT
 2040   REF   4  LAST  333   40,3155  0 3225 1            TC      DSPIN
 2041   REF   2  LAST  351   40,3156  10 137 C            CCS     WDCNT
 2042   REF   1               40,3157  0 3136 C            TC      DSPDCWD1
 2043   REF   7  LAST  337   40,3160  4 4374 1            CS      VD1
 2044   REF  45  LAST  352   40,3161  54 777 1            TS      DSPCOUNT
 2045   REF   2  LAST  351   40,3162  0 0115 1            TC      WDRET

 2046                        40,3163   C0000 1            OCT     00000
 2047                        40,3164   C2476 C  DECROUND  OCT     02476

R2048   DSPDECNR CONVERTS C( MPAC,MPAC+1) INTO A SIGN AND 5 CHAR DECIMAL
R2049   STARTING IN LOC SPECIFIED IN DSPCOUNT. IT DOES NOT ROUND

 2050   REF  96  LAST  351   40,3165  56 002 C  DSPDECNR XCH     Q
 2051   REF   3  LAST  352   40,3166  54 115 C            TS      WDRET
 2052   REF   2  LAST  351   40,3167  0 3103 C            TC      DSPSIGN
 2053   REF   2  LAST  352   40,3170  0 3135 C            TC      DSPDCWD1 -1

R2054   DSPDC2NR CONVERTS C( MPAC,MPAC+1) INTO A SIGN AND 2 CHAR DECIMAL
R2055   STARTING IN LOC SPECIFIED IN DSPCOUNT. IT DOES NOT ROUND

 2056   REF  97  LAST  352   40,3171  56 002 C  DSPDC2NR XCH     Q
 2057   REF   4  LAST  352   40,3172  54 115 C            TS      WDRET
 2058   REF   3  LAST  352   40,3173  0 3103 C            TC      DSPSIGN
 2059   REF  39  LAST  351   40,3174  3 4712 1            CAF     ONE
 2060   REF   3  LAST  352   40,3175  0 3136 C            TC      DSPDCWD1

R2061   DSP2DEC CONVERTS C(MPAC) AND C(MPAC+1) INTO A SIGN AND 10 CHAR DECIMAL
R2062   STARTING IN THE LOC SPECIFIED IN DSPCOUNT.

 2063   REF  98  LAST  352   40,3176  56 002 C  DSP2DEC  XCH     Q
 2064   REF   5  LAST  352   40,3177  54 115 C            TS      WDRET
 2065   REF  67  LAST  351   40,3200  3 4714 1            CAF     ZERO
 2066   REF   7  LAST  351   40,3201  54 124 1            TS      CODE
 2067   REF  12  LAST  332   40,3202  3 6214 C            CAF     THREE
 2068   REF   3  LAST  313   40,3203  0 3307 C            TC      11DSPIN        -R2 OFF
 2069   REF   5  LAST  351   40,3204  3 4710 C            CAF     FOUR
 2070   REF   4  LAST  352   40,3205  0 3307 C            TC      11DSPIN        +R2 OFF
 2071   REF   4  LAST  352   40,3206  0 3103 C            TC      DSPSIGN
 2072   REF   4  LAST  331   40,3207  3 4334 1            CAF     R2D1
 2073   REF   4  LAST  352   40,3210  0 3136 C  END2DEC   TC      DSPDCWD1

R2074   DSPDECVN DISPLAYS C(A) UPON ENTRY AS A 2 CHAR DECIMAL BEGINNING IN THE
R2075   DSP LOC SPECIFIED IN DSPCOUNT.
R2076   C(A) SHOULD BE IN FORM N X 2EXP-14. THIS IS SCALED TO FORM N/100 BEFORE
R2077   DISPLAY CONVERSION.
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2078                                40,3211  0 0006 1  DSPDECVN EXTEND
2079   REF   1                     40,3212  7 3221 1            MP      VNDSPCON        MULT BY .01
2080   REF 182  LAST  351          40,3213  22 154 1            LXCH    MPAC            TAKE RESULTS FROM L.(MULT BY 2EXP14).
2081   REF  68  LAST  352          40,3214  3 4714 1            CAF     ZERO
2082   REF 183  LAST  353          40,3215  54 155 1            TS      MPAC     +1
2083   REF  99  LAST  352          40,3216  56 002 0            XCH     Q
2084   REF   6  LAST  352          40,3217  54 115 0            TS      WDRET
2085   REF   3  LAST  333          40,3220  0 3174 0            TC      DSPDC2NR +3     NO SIGN, NO ROUND, 2 CHAR

2086                                40,3221   00244 0  VNDSPCON OCT     00244           .01 ROUNDED UP


2087   REF   3  LAST  330          40,3222  0 3211 0  GOVNUPDT TC      DSPDECVN        THIS IS NOT FOR GENERAL USE. REALLY PART
2088   REF  25  LAST  345          40,3223  0 4574 0            TC      POSTJUMP        OF UPDATVB.
2089   REF   2  LAST  321          40,3224   62346 1            CADR    UPDAT1   +2

2090                                40,3225            ENDECVN  EQUALS


2091   REF   1                     41,3353                     SETLOC  ENDSPF   +1
20915  REF   5 LAST  349 TO  351:     12    747*               COUNT   41/PIN

R2092  DSPDCTWO DISPLAYS C(A) UPON ENTRY AS A 5 CHAR OCT STARTING IN THE DSP
R2093  CHAR SPECIFIED IN DSPCOUNT. IT STOPS AFTER 5 CHAR HAVE BEEN DISPLAYED.

2094   REF   8  LAST  347          41,3353  54 022 0  DSPDCTWO TS      CYL
2095   REF 100  LAST  353          41,3354  56 002 0            XCH     Q
2096   REF   7  LAST  353          41,3355  54 115 0            TS      WDRET           MUST USE SAME RETURN AS DSP2BIT.
2097   REF  28  LAST  347          41,3356  3 4675 1            CAF     BIT14           TO BLANK SIGNS
2098   REF  46  LAST  352          41,3357  26 777 1            ADS     DSPCOUNT
2099   REF   6  LAST  352          41,3360  3 4710 0            CAF     FOUR
2100   REF   3  LAST  352          41,3361  54 137 0  WDAGAIN   TS      WDCNT
2101   REF   9  LAST  353          41,3362  4 0022 0            CS      CYL
2102   REF  10  LAST  353          41,3363  4 0022 0            CS      CYL
2103   REF  11  LAST  353          41,3364  4 0022 0            CS      CYL
2104   REF 107  LAST  352          41,3365  4 0000 0            CS      A
2105   REF   1                     41,3366  7 4716 1            MASK    DSPMSK
2106   REF 108  LAST  353          41,3367  50 000 1            INDEX   A
2107   REF   4  LAST  351          41,3370  3 4072 0            CAF     RELTAB
2108   REF   7  LAST  351          41,3371  7 4362 0            MASK    LOW5
2109   REF   8  LAST  352          41,3372  54 124 1            TS      CODE
2110   REF  47  LAST  353          41,3373  56 777 0            XCH     DSPCOUNT
2111   REF   5  LAST  351          41,3374  54 143 0            TS      COUNT
2112   REF 109  LAST  353          41,3375  10 000 0            CCS     A               DECREMENT DSPCOUNT EXCEPT AT +0
2113   REF  48  LAST  353          41,3376  54 777 1            TS      DSPCOUNT
2114   REF  26  LAST  353          41,3377  0 4574 0            TC      POSTJUMP
2115   REF   1                     41,3400   61315 1            CADR    DSPDCTIN
2116   REF   4  LAST  353          41,3401  10 137 0  DCTBACK   CCS     WDCNT
2117   REF   1                     41,3402  0 3361 0            TC      WDAGAIN         +
2118   REF   8  LAST  352          41,3403  4 4374 1  DSPLV     CS      VD1             TO BLOCK NUMERICAL CHARACTERS, CLEARS,
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 2119   REF  49  LAST  353   41,3404  54 777 1            TS      DSPCOUNT        AND SIGNS AFTER A COMPLETED DISPLAY.
 2120   REF   8  LAST  353   41,3405  0 0115 1            TC      WDRET

 2121   REF   7  LAST  340      4716            DSPMSK    =       SEVEN


R2122   DSP2BIT DISPLAYS C(A) UPON ENTRY AS A 2 CHAR OCT BEGINNING IN THE DSP
R2123   LOC SPECIFIED IN DSPCOUNT BY PRE CYCLING RIGHT C(A) AND USING THE LOGIC
R2124   OF THE 5 CHAR OCTAL DISPLAY

 2125   REF   3  LAST  197   41,3406  54 020 1  DSP2BIT   TS      CYR
 2126   REF 101  LAST  353   41,3407  56 002 0            XCH     Q
 2127   REF   9  LAST  354   41,3410  54 115 0            TS      WDRET
 2128   REF  40  LAST  352   41,3411  3 4712 1            CAF     ONE
 2129   REF   5  LAST  353   41,3412  54 137 0            TS      WDCNT
 2130   REF   4  LAST  354   41,3413  4 0020 1            CS      CYR
 2131   REF   5  LAST  354   41,3414  4 0020 1            CS      CYR
 2132   REF   6  LAST  354   41,3415  56 020 0            XCH     CYR
 2133   REF  12  LAST  353   41,3416  54 022 0            TS      CYL
 2134   REF   2  LAST  353   41,3417  0 3366 1            TC      WDAGAIN +5


R2135   FOR DSPIN PLACE 0/25 OCT INTO COUNT, 5 BIT RELAY CODE INTO CODE. BOTH
R2136   ARE DESTROYED. IF BIT14 OF COUNT IS 1, SIGN IS BLANKED WITH LEFT CHAR.
R2137   FOR DSPIN1 PLACE 0,1 INTO BIT11 OF CODE, 2 INTO COUNT, REL ADDRESS OF
R2138   DSPTAB ENTRY INTO DSREL.

 2139   REF   1                  40,3225                    SETLOC  ENDECVN

21395   REF   6 LAST  351 TC  353:     82   661*           COUNT   40/PIN

 2140   REF 102  LAST  354   40,3225  56 002 0  DSPIN     XCH     Q               CANT USE L FOR RETURN, SINCE MANY OF THE
 2141   REF   1                40,3226  54 114 1            TS      DSEXIT          ROUTINES CALLING DSPIN USE L AS RETURN.
 2142   REF   8  LAST  353   40,3227  3 4362 1            CAF     LOW5
 2143   REF   6  LAST  353   40,3230  7 0143 0            MASK    COUNT
 2144   REF   9  LAST  338   40,3231  54 021 0            TS      SR
 2145   REF  10  LAST  354   40,3232  56 021 1            XCH     SR
 2146   REF   1                40,3233  54 141 1            TS      DSREL
 2147   REF  29  LAST  290   40,3234  3 4712 1            CAF     BIT1
 2148   REF   7  LAST  354   40,3235  7 0143 0            MASK    COUNT
 2149   REF 110  LAST  353   40,3236  10 000 0            CCS     A
 2150                          40,3237  0 3241 0            TC      +2              LEFT IF COUNT IS ODD
 2151   REF   1                40,3240  0 3251 1            TC      DSPIN1  -1      RIGHT IF COUNT IS EVEN
 2152   REF   9  LAST  353   40,3241  56 124 0            XCH     CODE
 2153   REF   1                40,3242  0 4354 1            TC      SLEFT5          DOES NOT USE CYL
 2154   REF  10  LAST  354   40,3243  54 124 1            TS      CODE
 2155   REF  29  LAST  353   40,3244  3 4675 1            CAF     BIT14
 2156   REF   8  LAST  354   40,3245  7 0143 0            MASK    COUNT
 2157   REF 111  LAST  354   40,3246  10 000 0            CCS     A
 2158   REF  20  LAST  343   40,3247  3 4711 1            CAF     TWO             BIT14 = 1, BLANK SIGN
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 2159   REF  41  LAST  354   40,3250  6 4712 1          AD      ONE       BIT14 = 0, LEAVE SIGN ALONE
 2160   REF   9  LAST  354   40,3251  54 143 0          TS      COUNT     +0 INTO COUNT FOR RIGHT
A2161                                                                     +1 INTO COUNT FOR LEFT(SIGN LEFT ALONE)
A2162                                                                     +3 INTO COUNT FOR LEFT(TO BLANK SIGN)
 2163                          40,3252  0 0004 0  DSPIN1  INHINT
 2164   REF   2  LAST  354   40,3253  50 141 0          INDEX   DSREL
 2165   REF  24  LAST  315   40,3254  11*023 0          CCS     DSPTAB
 2166                          40,3255  0 3257 1          TC      +2        IF +
 2167   REF   6  LAST  341   40,3256  0 5642 1          TC      CCSHOLE
 2168   REF  42  LAST  355   40,3257  6 4712 1          AD      ONE       IF-
 2169   REF   1               40,3260  54 142 1          TS      DSMAG
 2170   REF  10  LAST  355   40,3261  50 143 1          INDEX   COUNT
 2171   REF   1               40,3262  7 3303 0          MASK    DSMSK
 2172                          40,3263  0 0006 1          EXTEND
 2173   REF  11  LAST  354   40,3264  60 124 0          SU      CODE
 2174                          40,3265  0 0006 1          EXTEND
 2175   REF   1               40,3266  1 3301 1          BZF     DSLV      SAME
 2176   REF  11  LAST  355   40,3267  50 143 1  DFRNT    INDEX   COUNT
 2177   REF   2  LAST  355   40,3270  4 3303 0          CS      DSMSK     MASK WITH 77740,76037,75777, OR 74037
 2178   REF   2  LAST  355   40,3271  7 0142 1          MASK    DSMAG
 2179   REF  12  LAST  355   40,3272  6 0124 0          AD      CODE
 2180   REF 112  LAST  354   40,3273  4 0000 0          CS      A
 2181   REF   3  LAST  355   40,3274  50 141 0          INDEX   DSREL
 2182   REF  25  LAST  355   40,3275  57*023 1          XCH     DSPTAB
 2183                          40,3276  0 0006 1          EXTEND
 2184   REF   2  LAST  355   40,3277  6 3301 0          BZMF    DSLV      DSPTAB ENTRY WAS -
 2185   REF   7  LAST  315   40,3300  25*016 1          INCR    NOUT      DSPTAB ENTRY WAS +
 2186                          40,3301  0 0003 1  DSLV    RELINT
 2187   REF   2  LAST  354   40,3302  0 0114 0          TC      DSEXIT

 2188                          40,3303   00037 0  DSMSK   OCT   37
 2189                          40,3304   01740 0          OCT   1740
 2190                          40,3305   02000 0          OCT   2000
 2191                          40,3306   03740 1          OCT   3740


R2192   FOR 11DSPIN, PUT REL ADDRESSS OF DSPTAB ENTRY INTO A, 1 IN BIT11 OR 0 IN
R2193   BIT11 OF CODE.

 2194   REF   4  LAST  355   40,3307  54 141 1  11DSPIN TS      DSREL
 2195   REF  21  LAST  354   40,3310  3 4711 1          CAF     TWO
 2196   REF  12  LAST  355   40,3311  54 143 0          TS      COUNT
 2197   REF 103  LAST  354   40,3312  56 002 0          XCH     Q         MUST USE SAME RETURN AS DSPIN
 2198   REF   3  LAST  355   40,3313  54 114 1          TS      DSEXIT
 2199   REF   2  LAST  354   40,3314  0 3252 1          TC      DSPIN1

 2200   REF   5  LAST  352   40,3315  0 3225 1  DSPOCTIN TC     DSPIN     SO DSPOCTWD DOESNT USE SWCALL
 2201                          40,3316  3 3320 0          CAF     +2
 2202   REF   4  LAST  340   40,3317  0 4577 0          TC      BANKJUMP
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 2203   REF   1              40,3320   63401 1  ENDSPOCT CADR    OCTBACK


R2204   DSPALARM FINDS TC NVSUBEND IN ENTRET FOR NVSUB INITIATED ROUTINES.
R2205   ABORT WITH 01501.
R2206   DSPALARM FINDS TC ENDOFJOB IN ENTRET FOR KEYBOARD INITIATED ROUTINES.
R2207   OC TC ENTRET.

 22075  REF   9  LAST  353   40,3321  4 4374 1  PREDSPAL CS      VD1
 22076  REF   50 LAST  354   40,3322  54 777 1           TS      DSPCOUNT
 2208   REF   1              40,3323  4 3342 C  DSPALARM CS      NVSBENDL
 2209   REF   8  LAST  347   40,3324  6 0136 C           AD      ENTEXIT
 2210                        40,3325  0 0006 1           EXTEND
 2211   REF   16 LAST  309   40,3326  1 3337 1           BZF     CHARALRM +2
 22111  REF   1              40,3327  4 3341 C           CS      MONADR          IF THIS IS A MONITOR, KILL IT
 22112  REF   9  LAST  356   40,3330  6 0136 C           AD      ENTEXIT
 22113                       40,3331  0 0006 1           EXTEND
 22114                       40,3332  1 3334 1           BZF     +2
 22115                       40,3333  0 3335 1           TC      +2
 22116  REF   1              40,3334  0 4220 C           TC      KILMONCN
 2212   REF   5  LAST  235   40,3335  0 4400 1  CHARALRM TC      FALTON          NOT NVSUB INITIATED. TURN ON OPR ERROR
 2213   REF   36 LAST  350   40,3336  0 5112 C           TC      ENDOFJOB
 2214   REF   1              40,3337  0 5622 1           TC      POODOO
 2217                        40,3340   01501 1           OCT     01501
 22171  REF   2  LAST  349   40,3341   C4140 C  MONADR   GENADR  PASTEVB
 2218   REF   1              40,3342  0 4216 C  NVSBENDL TC      NVSUBEND


R2219   ALMCYCLE TURNS ON CHECK FAIL LIGHT, REDISPLAYS THE ORIGINAL VERB THAT
R2220   WAS EXECUTED, AND RECYCLES TO EXECUTE THE ORIGINAL VERB/NOUN COMBINATION
R2221   THAT WAS LAST EXECUTED. USED FOR BAD DATA DURING LOAD VERBS AND BY
R2222   MOTBS. ALSO BY MMCHANG IF 2 NUMERICAL CHARACTERS WERE NOT PUNCHED IN
R2223   FOR MM CODE.

 2224   REF   3  LAST  349      4161                    SETLOC MID7     +1
 22245  REF   2 LAST  349 TO  349:    17     17*        COUNT  02/PIN


 2225   REF   6  LAST  356      4161  0 4400 1  ALMCYCLE TC      FALTON          TURN ON CHECK FAIL LIGHT.
 2228   REF   3  LAST  346      4162  4 1041 1           CS      VERBSAVE        GET ORIGINAL VERB THAT WAS EXECUTED
 2229   REF   11 LAST  349      4163  55*013 C           TS      REQRET          SET FOR ENTPASO
 2230   REF   50 LAST  349      4164  0 4555 C           TC      BANKCALL        PUTS ORIGINAL VERB INTO VERBREG AND
 2231   REF   8  LAST  349      4165   62336 C           CADR    UPDATVB -1      DISPLAYS IT IN VERB LIGHTS.
 2232   REF   27 LAST  353      4166  0 4574 C           TC      POSTJUMP
 2233   REF   2  LAST  309      4167   62002 1  ENDALM   CADR    ENTER


R2234   MMCHANG USES NOUN DISPLAY UNTIL ENTER. THEN IT USES MODE DISP.
R2235   IT GOES TO MODROUT WITH THE NEW M M CODE IN A, BUT NOT DISPLAYED IN
R2236   MM LIGHTS.
R2237   IT DEMANDS 2 NUMERICAL CHARACTERS BE PUNCHED IN FOR NEW MM CODE.
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R2238   IF NO1, IT RECYCLES.

 2239   REF   1                41,3420                        SETLOC DSP2BIT +100

 22395  REF   6 LAST  353 TO  354:     37   784*             COUNT  41/PIN

 2240   REF   1                41,3420   0 3442 C  MMCHANG   TC     REQMM          ENTPASHI ASSUMES THE TC REQMM AT MMCHANG
A2241                                                                               IF THIS MOVES AT ALL, MUST CHANGE
A2242                                                                               MMADREF AT ENTPASHI.
 2243   REF  16  LAST  252    41,3421   3 4706 1            CAF    BIT5           OCT20 = ND2.
 2244   REF  51  LAST  356    41,3422   6 0777 C            AD     DSPCOUNT       DSPCOUNT MUST = -ND2.
 2245                         41,3423   0 0006 1            EXTEND                DEMAND THAT 2 NUM CHAR WERE PUNCHED IN.
 2246                         41,3424   1 3426 C            BZF    +2
 2247   REF  16  LAST  346    41,3425   0 4161 C            TC     ALMCYCLE       DSPCOUNT NOT= -ND2. ALARM AND RECYCLE.
 2248   REF  69  LAST  353    41,3426   3 4714 1            CAF    ZERO           DSPCOUNT = -ND2.
 2249   REF  12  LAST  347    41,3427   57*002 1            XCH    NOUNREG
 2250   REF 184  LAST  353    41,3430   54 154 C            TS     MPAC
 2251   REF   3  LAST  321    41,3431   3 4375 1            CAF    ND1
 2252   REF  52  LAST  357    41,3432   54 777 1            TS     DSPCOUNT
 2253   REF  51  LAST  356    41,3433   0 4555 C            TC     BANKCALL
 2254   REF   4  LAST  315    41,3434    60502 C            CADR   2BLANK
 2255   REF  10  LAST  356    41,3435   4 4374 1            CS     VD1            BLOCK NUM CHAR IN
 2256   REF  53  LAST  357    41,3436   54 777 1            TS     DSPCOUNT
 2257   REF 185  LAST  357    41,3437   3 0154 1            CA     MPAC
 2258   REF  28  LAST  356    41,3440   0 4574 C            TC     POSTJUMP
 2259   REF   1                41,3441    10010 1            CADR   MODROUTB       GO THRU STANDARD LOC.


 2260   REF   2  LAST  260    04,2010                MODROUTB =     V37
 2261   REF 104  LAST  355    41,3442   4 0002 1     REQMM  CS     Q
 2262   REF  12  LAST  356    41,3443   55*013 C            TS     REQRET
 2263   REF   4  LAST  357    41,3444   3 4375 1            CAF    ND1
 2264   REF  54  LAST  357    41,3445   54 777 1            TS     DSPCOUNT
 2265   REF  70  LAST  357    41,3446   3 4714 1            CAF    ZERO
 2266   REF  13  LAST  357    41,3447   55*002 C            TS     NOUNREG
 2267   REF  52  LAST  357    41,3450   0 4555 C            TC     BANKCALL
 2268   REF   5  LAST  357    41,3451    60502 C            CADR   2BLANK
 2269   REF   3  LAST  321    41,3452   0 4443 C            TC     FLASHON
 2270   REF  43  LAST  355    41,3453   3 4712 1            CAF    ONE
 2271   REF  18  LAST  346    41,3454   55*000 1            TS     DECBRNCH       SET FOR DEC
 2272   REF  10  LAST  356    41,3455   0 0136 C            TC     ENTEXIT


R2273   VBRQEXEC ENTERS REQUEST TO EXEC     FOR ANY ADDRESS WITH ANY PRIORITY.
R2274   IT DOES ENDOFJOB AFTER ENTERING REQUEST. DISPLAY SYST IS RELEASED.
R2275   IT ASSUMES NOUN 26 HAS BEEN PRELOADED WITH
R2276   COMPONENT 1  PRIORITY(BITS 10-14) BIT1=0 FOR NOVAC, BIT1=1 FOR FINDVAC.
R2277   COMPONENT 2  JOB ADRES (12 BIT )
R2278   COMPONENT 3  BBCON
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2279   REF  30  LAST  354   41,3456  3 4712 1  VBRQEXEC CAF    BIT1
2280   REF  16  LAST  350   41,3457  7 1045 0           MASK   DSPTEM1
2281   REF 113  LAST  355   41,3460  10 000 0           CCS    A
2282   REF   1               41,3461  0 3500 1           TC     SETVAC          IF BIT1 = 1, FINDVAC
2283   REF   1               41,3462  3 4365 0           CAF    TCNOVAC         IF BIT1 = 0, NOVAC
2284   REF 186  LAST  357   41,3463  54 154 0  REQEX1    TS     MPAC            TC NOVAC  OR  TC FINDVAC INTO MPAC
2285   REF  31  LAST  358   41,3464  4 4712 0           CS     BIT1
2286   REF  17  LAST  358   41,3465  7 1045 0           MASK   DSPTEM1
2287   REF 187  LAST  358   41,3466  54 160 1           TS     MPAC     +4     PRIO INTO MPAC+4 AS A TEMP
2288   REF   5  LAST  318   41,3467  0 4473 0  REQUESTC TC     RELDSP
2289   REF   5  LAST  347   41,3470  3 4233 1           CA     ENDIDLE
2290   REF 188  LAST  358   41,3471  54 157 0           TS     MPAC     +3     TC ENDOFJOB INTO MPAC+3
2291                        41,3472  0 0006 1           EXTEND
2292   REF  18  LAST  358   41,3473  3 1047 0           DCA    DSPTEM1  +1     JOB ADRES INTO MPAC+1
2293   REF 189  LAST  358   41,3474  52 156 1           DXCH   MPAC     +1     BBCON INTO MPAC+2
2294   REF 190  LAST  358   41,3475  3 0160 0           CA     MPAC     +4     PRIO IN A
2295                        41,3476  0 0004 0           INHINT
2296   REF 191  LAST  358   41,3477  0 0154 1           TC     MPAC

2297   REF   1               41,3500  3 4370 1  SETVAC   CAF    TCFINDVC
2298   REF   1               41,3501  0 3463 0           TC     REQEX1

R2299  VBRQWAIT ENTERS REQLEST TO WAITLIST FOR ANY ADDRESS WITH ANY DELAY.
R2300  IT DOES ENDOFJOB AFTER ENTERING REQUEST.DISPLAY SYST IS RELEASED.
R2301  IT ASSUMES NOUN 26 HAS BEEN PRELOADED WITH
R2302  COMPONENT 1  DELAY (LOW BITS)
R2303  COMPONENT 2  TASK ADRES (12 BIT)
R2304  COMPONENT 3  BBCON

2305   REF   1               41,3502  3 4366 0  VBRQWAIT CAF    TCWAIT
2306   REF 192  LAST  358   41,3503  54 154 0           TS     MPAC            TC WAITLIST INTO MPAC
2307   REF  19  LAST  358   41,3504  3 1045 1           CA     DSPTEM1         TIME DELAY
2308   REF   1               41,3505  0 3466 0  ENDRQWT  TC     REQUESTC -1

R2309  REQLESTC WILL PUT TASK ADRES INTO MPAC+1, BBCON INTO MPAC+2,
R2310  TC ENDOFJOB INTO MPAC+3. IT WILL TAKE TIME DELAY OUT OF MPAC+4 AND
R2311  LEAVE IT IN A, INHINT AND TC MPAC.

2312   REF   2  LAST  356   40,3343                    SETLOC NVSBENDL +1
23129  REF   7 LAST  354 TC  356:    78   739*         COUNT  40/PIN

2313   REF  44  LAST  357   40,3343  3 4712 1  VBPROC   CAF    ONE             PROCEED WITHOUT DATA
2314   REF   2  LAST  337   40,3344  55'014 1           TS     LOADSTAT
2315   REF   2  LAST  356   40,3345  0 4220 0           TC     KILMONON        TURN ON KILL MONITOR BIT
2316   REF   6  LAST  358   40,3346  0 4473 0           TC     RELDSP
2317   REF   3  LAST  316   40,3347  0 4447 1           TC     FLASHOFF
2318   REF   2  LAST  337   40,3350  0 3450 0           TC     RECALTST        SEE IF THERE IS ANY RECALL FROM ENDIDLE
```

```
 2319   REF  45  LAST  358   40,3351  4 4712 C  VBTERM   CS     ONE
 2320   REF   2  LAST  319   40,3352  0 3344 1           TC     VBPROC  +1      TERM VERB SETS LOADSTAT NEG


R23201  PROCKEY PERFORMS THE SAME FUNCTION AS VBPROC.  IT MUST BE CALLED UNDER
R23202  EXECUTIVE CONTROL, WITH CHRPRIO.
 23205  REF  71  LAST  357   40,3353  3 4714 1  PROCKEY  CAF    ZERO            SET REQRET FOR ENTER PASS 0.
 23206  REF  13  LAST  357   40,3354  55'013 C           TS     REQRET
 23207  REF  11  LAST  357   40,3355  4 4374 1           CS     VD1             BLOCK NUMERICAL CHARACTERS, SIGNS, CLEAR
 23208  REF  55  LAST  357   40,3356  54 777 1           TS     DSPCOUNT
 23209  REF   3  LAST  359   40,3357  0 3343 C           TC     VBPROC


R2321   VBRESEQ WAKES ENDIDLE AT SAME LINE AS FINAL ENTER OF LOAD (L+3).
R2322   (MAIN USE IS INTENDED AS RESPONSE TO INTERNALLY INITIATED FLASHING
R2323    DISPLAYS IN ENDIDLE. SHOULD NOT BE USED WITH LOAD VERBS,PLEASE PERFORM,
R2324    OR PLEASE MARK VERBS BECAUSE THEY ALREADY USE L+3 IN ANOTHER CONTEXT.)

 2325   REF  72  LAST  359   40,3360  4 4714 C  VBRESEQ  CS     ZERO            MAKE IT LOOK LIKE DATA IN.
 2326   REF   4  LAST  359   40,3361  0 3344 1           TC     VBPROC +1


R2327   FLASH IS TURNED OFF BY PROCEED WITHOUT DATA, TERMINATE, RESEQUENCE,
R2328   END OF LOAD.
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P2329   KEY RELEASE ROUTINE

R2330   THIS ROUTINE ALWAYS TURNS OFF THE UPACT LIGHT AND ALWAYS CLEARS DSPLOCK.

R2331   THE HIGHEST PRIORITY FUNCTION OF THE KEY RELEASE BUTTON IS THE
R2332   UNSUSPENDING OF A SUSPENDED MONITOR WHICH WAS EXTERNALLY INITIATED.
R2333   THIS FUNCTION IS ACCOMPLISHED BY CLEARING DSPLOCK AND TURNING OFF
R2334   THE KEY RELEASE LIGHT IF BOTH DSPLIST AND CADRSTOR ARE EMPTY.

R2335   IF NO SUCH MONITOR EXISTS, THEN RELDSP IS EXECUTED TO CLEAR DSPLOCK
R2336   AND THE EXTERNAL MONITOR BIT (FREEING THE DISPLAY SYSTEM FOR INTERNAL
R2337   USE), TURN OFF THE KEY RELEASE LIGHT, AND WAKE UP ANY JOB IN DSPLIST.

R2338   IN ADDITION IF THERE IS A JOB IN ENDIDLE, THEN CONTROL IS TRANSFERRED
R2339   TO PINBRNCH (IN DISPLAY INTERFACE ROUTINE) TO RE-EXECUTE THE SERIES OF
R23391  NVSUB CALLS ETC. THAT PRECEDED THE ENDIDLE CALL STILL AWAITING RESPONSE.
R2340   THIS FEATURE IS INTENDED FOR USE WHEN THE OPERATOR HAS BEEN REQUESTED TO
R2341   RESPOND TO SOME INTERNAL ACTION THAT USED ENDIDLE, BUT HE HAS WRITTEN
R2342   OVER THE INFORMATION ON THE DISPLAY PANEL BY SOME DISPLAYS OF HIS OWN
R2343   INITIATION WHICH DO NOT SERVE AS RESPONSES. HITTING KEY RLSE WILL
R2344   RE-ESTABLISH THE DISPLAYS TO THE STATE THEY WERE IN BEFORE HE OBSCURED
R2345   THEM, SO THAT HE CAN SEE THE WAITING REQUEST.  THIS WORKS ONLY FOR
R2346   INTERNAL PROGRAMS THAT USED ENDIDLE THROUGH MARGARETS DISPLAY
R2347   SUBROUTINES.

2348   REF  14  LAST  334   40,3362  4 4710 1  VBRELDSP CS     BIT3
2349                        40,3363  0 0006 1            EXTEND
2350   REF  10  LAST  192   40,3364  03 011 1           WAND   DSALMOUT       TURN OFF UPACT LITE
2351   REF   2  LAST  308   40,3365  10 115 0           CCS    21/22REG       OLD DSPLOCK
2352   REF  30  LAST  354   40,3366  3 4675 1           CAF    BIT14
2353   REF   6  LAST  349   40,3367  7 1021 1           MASK   MONSAVE1       EXTERNAL MONITOR BIT (EMB)
2354   REF 114  LAST  358   40,3370  10 000 0           CCS    A
2355   REF   1              40,3371  0 3400 0           TC     UNSUSPEN       OLD DSPLOCK AND EMB BOTH 1, UNSUSPEND.
2356   REF   7  LAST  358   40,3372  0 4473 0  TSTLTS4  TC     RELDSP         NOT UNSUSPENDING EXTERNAL MONITOR,
2357   REF   5  LAST  348   40,3373  11'042 1           CCS    CADRSTOR        RELEASE DISPLAY SYSTEM AND
2358                        40,3374  0 3376 0           TC     +2              DO RE-ESTABLISH IF CADRSTOR IS FULL.
2359   REF  37  LAST  356   40,3375  0 5112 0           TC     ENDOFJOB
2360   REF  29  LAST  357   40,3376  0 4574 0           TC     POSTJUMP
2361   REF   4  LAST  258   40,3377  21176 1            CADR   PINBRNCH
2362   REF  73  LAST  359   40,3400  3 4714 1  UNSUSPEN CAF    ZERO           EXTERNAL MONITOR IS SUSPENDED,
2363   REF   5  LAST  348   40,3401  55'012 1           TS     DSPLOCK         JUST UNSUSPEND IT BY CLEARING DSPLOCK.
2364   REF   6  LAST  360   40,3402  11'042 1           CCS    CADRSTOR        TURN KEY RELEASE LIGHT OFF IF BOTH
2365   REF  38  LAST  360   40,3403  0 5112 0           TC     ENDOFJOB        CADRSTOR AND DSPLIST ARE EMPTY.
2366   REF   2  LAST  348   40,3404  0 4516 1           TC     RELDSP1
23661  REF  35  LAST  360   40,3405  0 5112 0           TC     ENDOFJOB

2367                        40,3406            ENDRELDS EQUALS
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P2368   NVSUB IS USED FOR SUB ROUTINE CALLS FROM WITHIN COMPUTER. IT CAN BE
R2369   USED TO CALL THE COMBINATION OF ANY DISPLAY, LOAD, OR MONITOR VERB
R2370   TOGETHER WITH ANY NOUN AVAILABLE TO THE KEYBOARD.
R23701  PLACE OVVVVVVVVNNNNNNN INTO A.
R23702  V-S ARE THE 7 BIT VERB CODE.  N-S ARE THE 7 BIT NOUN CODE.

R23703  IF NVSUB IS CALLED WITH THE FOLLOWING NEGATIVE NUMBERS (RATHER THAN THE
R23704  VERB-NOUN CODE) IN A, THEN THE DISPLAY IS BLANKED AS FOLLOWS-
R23705   -4 FULL BLANK, -3 LEAVE MODE, -2 LEAVE MODE AND VERB, -1 BLANK R-S ONLY

R2371   NVSUB CAN BE USED WITH MACH CADR TO BE SPEC BY PLACING THE CADR INTO
R2372   MPAC+2 BEFORE THE STANDARD NVSUB CALL.

R2373    NVSUB RETURNS TO 2+ CALLING LOC AFTER PERFORMING TASK, IF DISPLAY
R2374   SYSTEM IS AVAILABLE. THE NEW NOUN AND VERB CODES ARE DISPLAYED.
R2375   IF V:S =0, THE NEW NOUN CODE IS DISPLAYED ONLY(RETURN WITH NO FURTHER
R2376   ACTION). IF N-S =0, THE NEW VERB CODE IS DISPLAYED ONLY(RETURN WITH NO
R2377   FURTHER ACTION).

R2378   IT RETURNS TO 1+ CALLING LOC WITHOUT PERFORMING TASK, IF DISPLAY
R2379   SYSTEM IS BLOCKED (NOTHING IS DISPLAYED IN THIS CASE).
R2380   IT DOES TC ABORT (WITH OCT 01501) IF IT ENCOUNTERS A DISPLAY PROGRAM
R2381   ALARM CONDITION BEFORE RETURN TO CALLER.

R2382   THE DISPLAY SYSTEM IS BLOCKED BY THE DEPRESSION OF ANY
R2383   KEY, EXCEPT ERROR LIGHT RESET
R2384   IT IS RELEASED BY THE KEY RELEASE BUTTON, ALL EXTENDED VERBS,
R2385   PROCEED WITHOUT DATA, TERMINATE, RESEQUENCE, INITIALIZE EXECUTIVE,
R2386   RECALL PART OF RECALTST IF ENDIDLE WAS USED,
R2387   VB = REQUEST EXECUTIVE, VB = REQUEST WAITLIST,
R2388   MONITOR SET UP.

R23881  THE DISPLAY SYSTEM IS ALSO BLOCKED BY THE EXTERNAL MONITOR BIT, WHICH
R23882  INDICATES AN EXTERNALLY INITIATED MONITOR IS RUNNING (SEE MONITOR)

R2389   A NVSUB CALL THAT PASSES DSPLOCK AND THE EXTERNAL MONITOR BIT ENDS OLD
R23891  MONITOR.

R2390   DSPLOCK IS THE INTERLOCK FOR USE OF KEYBOARD AND DISPLAY SYSTEM WHICH
R2391   LOCKS OUT INTERNAL USE WHENEVER THERE IS EXTERNAL KEYBOARD ACTION.

R23911  NVSUB SHOULD BE USED TWICE IN SUCCESSION FOR :PLEASE PERFORM: SITUATIONS
R23912  (SIMILARLY FOR PLEASE MARK). FIRST PLACE THE CODED NUMBER FOR WHAT
R23913  ACTION IS DESIRED OF OPERATOR INTO THE REGISTERS REFERRED TO BY THE
R23914  :CHECKLIST: NOUN. GO TO NVSUB WITH A DISPLAY VERB AND THE :CHECKLIST:
R23915  NOUN. GO TO NVSUB AGAIN WITH THE :PLEASE PERFORM: VERB AND ZEROS IN THE
R23916  LOW 7 BITS. THIS :PASTES UP: THE :PLEASE PERFORM: VERB INTO THE VERB
R23917  LIGHTS.

R23918  NVMCNCPT IS AN ENTRY SIMILAR TO NVSUB, BUT REQUIRING AN ADDITIONAL
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R239181 PARAMETER IN L. IT SHOULD BE USED ONLY WITH A MONITOR VERB-NOUN CODE IN
R239182 A. AFTER EACH MONITOR DISPLAY A *PLEASE* VERB WILL BE PASTED IN THE VERB
R239183 LIGHTS OR DATA WILL BE BLANKED (OR BOTH) ACCORDING TO THE OPTIONS
R239184 SPECIFIED IN L. IF BITS 8-14 OF L ARE OTHER THAN ZERO, THEN THEY WILL
R239185 BE INTERPRETED AS A VERB CODE AND PASTED IN THE VERB LIGHTS. (THIS VERB
R239186 CODE SHOULD DESIGNATE ONE OF THE *PLEASE* VERBS.) IF BITS 1-3 OF L ARE
R239187 OTHER THAN ZERO, THEN THEY WILL BE USED TO BLANK DATA BY BEING FED TO
R239188 BLANKSUB. IF NVMONOPT IS USED WITH A VERB OTHER THAN A MONITOR VERB,
R239189 THE PARAMETER IN L HAS NO EFFECT.

R2392   NVSUB IN FIXED-FIXED PLACES 2+CALLING LOC INTO NVQTEM, TC NVSUBEND INTO
R2393   ENTRET. (THIS WILL RESTORE OLD CALLING BANK BITS)

 2394   REF   1                    4170                    SETLOC ENDALM +1

 23945  REF   3 LAST  356 TO  357:     7    24*           COUNT  02/PIN

 2395                              4170  22 007 C  NVSUB   LXCH   7          ZERO NVMONOPT OPTIONS
 2396   REF   1                    4171  54 123 C  NVMONOPT TS     NVTEMP
 2397   REF  31  LAST  360         4172  3 4675 1          CAF    BIT14
 23971  REF   7  LAST  360         4173  7 1021 1          MASK   MONSAVE1     EXTERNAL MONITOR BIT
 23972  REF   6  LAST  360         4174  6 1012 C          AD     DSPLOCK
 23973  REF 115  LAST  360         4175  10 000 C          CCS    A
 23974  REF 109  LAST  357         4176  0 0002 C          TC     Q            DSP SYST BLOCKED. RET TO 1+ CALLING LOC
 2398   REF  46  LAST  359         4177  3 4712 1          CAF    ONE          DSP SYST AVAILABLE
 2399   REF 106  LAST  362         4200  6 0002 C  NVSECOM AD     Q
 2400   REF   1                    4201  55*037 C          TS     NVQTEM       2+ CALLING LOC INTO NVQTEM
 24001  REF   4  LAST  349         4202  23*022 C          LXCH   MONSAVE2     STORE NVMONOPT OPTIONS
 2401   REF   3  LAST  358         4203  0 4220 C          TC     KILMONON     TURN ON KILL MONITOR BIT
 2402   REF   1                    4204  3 4215 C  NVSUBCOM CAF    NVSBBBNK

 2403   REF  10  LAST  127         4205  56 006 1          XCH    BBANK
 24031                             4206  0 0006 1          EXTEND              SAVE OLD SUPERBITS
 24032  REF   3  LAST  237         4207  04 007 1          ROR    SUPERBNK
 2404   REF   1                    4210  55*040 C          TS     NVBNKTEM
 24041  REF   2  LAST  237         4211  3 4215 C          CAF    PINSUPBT
 24042                             4212  0 0006 1          EXTEND
 24043  REF   4  LAST  362         4213  01 007 1          WRITE  SUPERBNK
 2405   REF   1                    4214  0 2000 C          TC     NVSUBB       GO TO NVSUB1 THRU STANDARD LOC
 2406   REF  56  LAST  359         0777                    EBANK= DSPCOUNT
 2407   REF   2  LAST  316         4215   62101 C  NVSBBBNK BBCON  NVSUB1

 24071  REF   2  LAST  362         4215            PINSUPBT =     NVSBBBNK     CONTAINS THE PINBALL SUPERBITS.

 2412   REF   2  LAST  362         4216  53*040 C  NVSUBEND DXCH   NVQTEM      NVBNKTEM MUST = NVQTEM+1
 2413   REF   1                    4217  0 5122 C          TC     SUPDXCHZ     DTCB WITH SUPERBIT SWITCHING

 2414   REF   1                41,3506                    SETLOC ENDRCWT +1

 241405 REF   7 LAST  357 TO  358:    54    838*          COUNT  41/PIN
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R241412 BLANKDSP BLANKS DISPLAY ACCORDING TO OPTION NUMBER IN NVTEMP AS FOLLOWS
R241415 -4 FULL BLANK, -3 LEAVE MODE, -2 LEAVE MODE AND VERB, -1 BLANK R-S ONLY

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 241419 REF    8  LAST  354    41,3506  6 4716 C  BLANKDSP AD      SEVEN          7,8,9,OR 10 (A HAD 0,1,2,OR 3)
 241422                       41,3507  0 0004 C           INHINT
 241425 REF   13  LAST  359    41,3510  54 124 1           TS      CODE           BLANK SPECIFIED DSPTABS
 241429 REF   18  LAST  342    41,3511  4 4677 1           CS      BIT12
 241432 REF   14  LAST  363    41,3512  50 124 0           INDEX   CODE
 241435 REF   26  LAST  355    41,3513  57'023 1           XCH     DSPTAB
 241439 REF  116  LAST  362    41,3514  10 000 0           CCS     A
 241442 REF    8  LAST  355    41,3515  25'016 1           INCR    NOUT
 241445                       41,3516  0 3517 1           TC      +1
 241449 REF   15  LAST  363    41,3517  10 124 1           CCS     CODE
 241452 REF    1              41,3520  0 3510 0           TC      BLANKDSP +2
 241455                       41,3521  0 0003 1           RELINT
 241459 REF    2  LAST  362    41,3522  50 123 1           INDEX   NVTEMP
 241462                       41,3523  0 3530 1           TC      +5
 241465                       41,3524  0 3525 0           TC      +1             NVTEMP HAS -4 (NEVER TOUCH MODREG)
 241469 REF   19  LAST  349    41,3525  55'001 0           TS      VERBREG                -3
 241472 REF   14  LAST  357    41,3526  55'002 0           TS      NOUNREG                -2
 241475 REF   12  LAST  337    41,3527  55'015 0           TS      CLPASS                 -1
 241479 REF   12  LAST  359    41,3530  4 4374 1           CS      VD1
 241482 REF   57  LAST  362    41,3531  54 777 1           TS      DSPCOUNT
 241485 REF    4  LAST  358    41,3532  0 4447 1           TC      FLASHOFF       PROTECT AGAINST INVISIBLE FLASH
 241489 REF    1              41,3533  0 3556 1           TC      ENTSET -2      ZEROS REQRET

  2415  REF    2  LAST  363    41,3534  3 3560 1  NVSUB1   CAF     ENTSET         IN BANK
  2416  REF    6  LAST  349    41,3535  54 136 1           TS      ENTRET         SET RETURN TO NVSUBEND
 24161  REF    3  LAST  363    41,3536  10 123 0           CCS     NVTEMP         WHAT NOW
 24162                        41,3537  0 3543 0           TC      +4             NORMAL NVSUB CALL (EXECUTE VN OR PASTE)
 24163  REF   19  LAST  325    41,3540  0 2350 0           TC      GODSPALM
 24164  REF    2  LAST  363    41,3541  0 3506 1           TC      BLANKDSP       BLANK DISPLAY AS SPECIFIED
 24165  REF   20  LAST  363    41,3542  0 2350 0           TC      GODSPALM
  2417  REF    5  LAST  349    41,3543  3 6043 0           CAF     LOW7
  2418  REF    4  LAST  363    41,3544  7 0123 0           MASK    NVTEMP
  2419  REF  193  LAST  358    41,3545  54 157 0           TS      MPAC     +3    TEMP FOR NOUN (CANT USE MPAC. DSPDECVN
  2420  REF    5  LAST  363    41,3546  3 0123 1           CA      NVTEMP                 USES MPAC, +1, +2
  2422  REF    5  LAST  349    41,3547  54 023 1           TS      EDOP           RIGHT 7
  2423  REF    6  LAST  363    41,3550  3 0023 0           CA      EDOP
  2424  REF  194  LAST  363    41,3551  54 160 1           TS      MPAC     +4    TEMP FOR VERB (CANT USE MPAC+1. DSPDECVN
 A2425                                                                  USES MPAC, +1, +2).
  2426  REF  195  LAST  363    41,3552  10 157 0           CCS     MPAC     +3    TEST NOUN
  2427  REF    1              41,3553  0 3561 0           TC      NVSUB2         IF NOUN NOT +0, GO ON
  2428  REF  196  LAST  363    41,3554  3 0160 0           CA      MPAC     +4
  2429  REF    9  LAST  356    41,3555  0 2336 0           TC      UPDATVB -1     IF NOUN = +0, DISPLAY VERB . THEN RETURN
 24291  REF   74  LAST  360    41,3556  3 4714 1           CAF     ZERO           ZERO REQRET SO THAT PASTED VERBS CAN
 24292  REF   14  LAST  359    41,3557  55'013 0           TS      REQRET         BE EXECUTED BY OPERATOR.
  2430  REF    2  LAST  356    41,3560  0 4216 0  ENTSET   TC      NVSUBEND
  2431  REF  197  LAST  363    41,3561  10 160 1  NVSUB2   CCS     MPAC +4        TEST VERB
  2432                        41,3562  0 3566 1           TC      +4             IF VERB NOT +0, GO ON
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 2433   REF 158  LAST 363   41,3563  3 0157 1          CA     MPAC     +3
 2434   REF   2  LAST 349   41,3564  0 2316 1          TC     UPDATNN  -1      IF VERB = +0, DISPLAY NOUN. THEN RETURN
 2435   REF   3  LAST 363   41,3565  0 4216 C          TC     NVSUBEND
 2436   REF 159  LAST 364   41,3566  3 0156 C          CA     MPAC     +2      TEMP FOR MACH CADR TO BE SPEC. (DSPDECVN
 2437   REF 200  LAST 364   41,3567  54 161 C          TS     MPAC     +5                 USES MPAC, +1, +2)
 2438   REF 201  LAST 364   41,3570  3 0160 C          CA     MPAC     +4
 2439   REF  10  LAST 363   41,3571  0 2336 C          TC     UPDATVB  -1      IF BOTH NOUN AND VERB NOT +0, DISPLAY
 2440   REF 202  LAST 364   41,3572  3 0157 1          CA     MPAC     +3      BOTH AND GO TO ENTPASO.
 2441   REF   3  LAST 364   41,3573  0 2316 1          TC     UPDATNN  -1
 2442   REF  75  LAST 363   41,3574  3 4714 1          CAF    ZERO
 2443   REF   3  LAST 358   41,3575  55'014 1          TS     LOADSTAT         SET FOR WAITING FOR DATA CONDITION
 2444   REF  13  LAST 363   41,3576  55'015 C          TS     CLPASS
 2445   REF  15  LAST 363   41,3577  55'013 C          TS     REQRET           SET REQRET FOR PASS 0.
 2446   REF 203  LAST 364   41,3600  3 0161 1          CA     MPAC     +5      RESTORES MACH CADR TO BE SPEC TO MPAC+2
 2447   REF 204  LAST 364   41,3601  54 156 1          TS     MPAC     +2      FOR USE IN INTMCTBS (IN ENTPASO).
 2448   REF   3  LAST 316   41,3602  0 2035 0  ENDNVSB1 TC     ENTPASO

R2449   IF INTERNAL MACH CADR TO BE SPECIFIED, MPAC+2 WILL BE PLACED INTO
R2450   NOUNCADR IN ENTPASO (INTMCTBS ).

 2451   REF   4  LAST 364       4220                   SETLOC NVSUBEND +2
 2451.5 REF   4  LAST 362 TO  362:    24    48*        COUNT  02/PIN
A2452                                                  FORCE BIT 15 OF MONSAVE1 TO 1.
 2453   REF  26  LAST 337       4220  3 4674 C  KILMONON CAF    BIT15            THIS IS THE KILL MONITOR BIT.
 2454   REF   8  LAST 362       4221  55'021 1          TS     MONSAVE1         TURN OFF BIT 14, THE EXTERNAL
A2455                                                   MONITOR BIT.
 2458   REF 107  LAST 362       4222  0 0002 C          TC     Q

R2459   LOADSTAT  +0 INACTIVE(WAITING FOR DATA). SET BY NVSUB
R2460             +1  PROCEED NO DATA. SET BY SPECIAL VERB
R2461            -1 TERMINATE   SET BY SPECIAL VERB
R2462            -0    DATA IN      SET BY END OF LOAD ROUTINE
R2463               OR RESEQUENCE   SET BY VERB 32

R2464   L  TC ENDIDLE  (FIXED FIXED)
R2465   ROUTINES THAT REQUEST LOADS THROUGH NVSUB SHOULD USE ENDIDLE WHILE
R2466   WAITING FOR THE DATA TO BE LOADED. ENDIDLE PUTS CURRENT JOB TO SLEEP.
R2467   ENDIDLE CANNOT BE CALLED FROM ERASABLE OR F/F MEMORY,
R2468   SINCE JOBSLEEP AND JOBWAKE CAN HANDLE ONLY FIXED BANKS.
R2469   RECALTST TESTS LOADSTAT AND WAKES JOB UP TO,
R2470   L+1       FOR TERMINATE
R2471   L+2       FOR PROCEED WITHOUT DATA
R2472   L+3       FOR DATA IN, OR RESEQUENCE
R2473   IT DOES NOTHING IF LOADSTAT INDICATES WAITING FOR DATA.
```

R2474 ENDIDLE ABORTS (WITH CODE 01206) IF A SECOND JOB ATTEMPTS TO GO TO SLEEP
R2475 IN PINBALL. IN PARTICULAR, IF AN ATTEMPT IS MADE TO GO TO ENDIDLE WHEN
R2476 1) CADRSTOR NOT= +0. THIS IS THE CASE WHERE THE CAPACITY OF ENDIDLE IS
R2477 EXCEEDED. (+-NZ INDICATE A JOB IS ALREADY ASLEEP DUE TO ENDIDLE.)
R2478 2) DSPLIST NOT= +0. THIS INDICATES A JOB IS ALREADY ASLEEP DUE TO
R2479 NVSUBLSY.

```
2480  REF 108  LAST 364    4223  22 002 C  ENDIDLE  LXCH  Q          RETURN ADDRESS INTO L.
2481  REF   1              4224  0 4234 C           TC    ISCADR+0   ABORT IF CADRSTOR NOT= +0
2482  REF   1              4225  0 4240 C           TC    ISLIST+0   ABORT IF DSPLIST NOT= +0
2483  REF  41  LAST 350    4226  3 0001 C           CA    L          DONT SET DSPLOCK TO 1 SO CAN USE
2484  REF   4  LAST 263    4227  7 4747 C           MASK  LOW10      ENDIDLE WITH NVSUB INITIATED MONITOR.
2485  REF   1              4230  6 0004 C           AD    FBANK      SAME STRATEGY FOR CADR AS MAKECADR.
2486  REF   7  LAST 360    4231  55'042 1           TS    CADRSTOR
2487  REF   1              4232  0 5070 C           TC    JOBSLEEP

2488  REF  40  LAST 360    4233  0 5112 C  ENDINST  TC    ENDOFJOB

2489  REF   8  LAST 365    4234  11'042 1  ISCADR+0 CCS   CADRSTOR   ABORTS (CODE 01206) IF CADRSTOR NOT= +0.
2490  REF   1              4235  0 4243 C           TC    DSPABORT   RETURNS IF CADRSTOR = +0.
2491  REF 109  LAST 365    4236  0 0002 C           TC    Q
2492  REF   2  LAST 365    4237  0 4243 C           TC    DSPABORT
2493  REF   2  LAST 187    4240  11'043 0  ISLIST+0 CCS   DSPLIST    ABORTS (CODE 01206) IF DSPLIST NOT= +0.
2494  REF   3  LAST 365    4241  0 4243 C           TC    DSPABORT   RETURNS IF DSPLIST = +0.
2495  REF 110  LAST 365    4242  0 0002 C           TC    Q
2496  REF   2  LAST 356    4243  0 5622 1  DSPABORT TC    POODOO
2497                        4244   01206 1           OCT   01206
```

R2498 JAMTERM ALLOWS PROGRAMS TO PERFORM THE TERMINATE FUNCTION.
R2499 IT DOES ENDOFJOB.

```
2500  REF   3  LAST 362    4245  3 4215 C  JAMTERM  CAF   PINSLPBT
2501                        4246  0 0006 1           EXTEND
25011 REF   5  LAST 362    4247  01 007 1           WRITE SUPERBNK
25012 REF   1              4250  3 4256 1           CAF   34DEC
25013 REF  16  LAST 364    4251  55'013 0           TS    REQRET     LEAVE ENTER SET FOR ENTPASSO.
2502  REF  13  LAST 363    4252  4 4374 1           CS    VD1
2503  REF  98  LAST 363    4253  54 777 1           TS    DSPCOUNT
2504  REF  30  LAST 360    4254  0 4574 C           TC    POSTJUMP
2505  REF   2  LAST 319    4255   61351 1           CADR  VBTERM

2506                        4256   00042 1  34DEC    DEC   34
```

R2507 JAMPROC ALLOWS PROGRAMS TO PERFORM THE PROCEED/PROCEED WITHOUT DATA
R2508 FUNCTION. IT DOES ENDOFJOB.

```
 2509   REF    4  LAST  365        4257  3 4215 C  JAMPROC  CAF     PINSUPBT
 2510                              4260  0 0006 1           EXTEND
 25101  REF    6  LAST  365        4261  01 007 1           WRITE   SUPERBNK
 25102  REF    1                  4262  3 4270 C           CAF     33DEC
 25103  REF   17  LAST  365        4263  55'013 C           TS      REQRET          LEAVE ENTER SET FOR ENTPASSO.
 2511   REF   14  LAST  365        4264  4 4374 1           CS      VD1
 2512   REF   59  LAST  365        4265  54 777 1           TS      DSPCOUNT
 2513   REF   31  LAST  365        4266  0 4574 C           TC      POSTJUMP
 2514   REF    5  LAST  359        4267   61343 1           CADR    VBPROC

 2515                              4270   00041 1  33DEC     DEC     33


R2532   BLANKSUB BLANKS ANY COMBINATION OF R1, R2, R3.
R2533   CALL WITH BLANKING CODE IN A.
R2534   BIT1=1 BLANKS R1, BIT2=1 BLANKS R2, BIT3=1 BLANKS R3.
R2535   ANY COMBINATION OF THESE BITS IS ACCEPTED.

R2536   DSPCOUNT IS RESTORED TO STATE IT WAS IN BEFORE BLANKSUB WAS EXECUTED.

 2538   REF    9  LAST  363        4271  7 4716 1  BLANKSUB MASK    SEVEN
 25381  REF    6  LAST  363        4272  54 123 C           TS      NVTEMP          STORE BLANKING CODE IN NVTEMP.
 2539   REF   32  LAST  362        4273  3 4675 1           CAF     BIT14
 2540   REF    9  LAST  364        4274  7 1021 1           MASK    MONSAVE1        EXTERNAL MONITOR BIT
 25401  REF    7  LAST  362        4275  6 1012 C           AD      DSPLOCK
 25402  REF  117  LAST  363        4276  10 000 C           CCS     A
 25403  REF  111  LAST  365        4277  0 0002 0           TC      Q               DSP SYST BLOCKED. RET TO 1+ CALLING LOC
 25404  REF  112  LAST  366        4300  24 002 C           INCR    Q               DSP SYST AVAILABLE
A2541                                                                             SET RETURN FOR 2+ CALLING LOC
 25411  REF    7  LAST  366        4301  10 123 C           CCS     NVTEMP
 25412                              4302  1 4304 C           TCF     +2
 25413  REF  113  LAST  366        4303  0 0002 C           TC      Q               NOTHING TO BLANK. RET TO 2+ CALLING LOC
 2542   REF  114  LAST  366        4304  22 002 C           LXCH    Q               SET RETURN FOR 2 + CALLING LOC
 2544   REF    1                  4305  3 4316 1           CAF     BLNKBBNK
 2545   REF   11  LAST  362        4306  56 006 1           XCH     BBANK
 25451                              4307  0 0006 1           EXTEND
 25452  REF    7  LAST  366        4310  04 007 1           ROR     SUPERBNK        SAVE OLD SUPERBITS.
 2546   REF   40  LAST  324        4311  52 131 C           DXCH    BUF
 25461  REF    5  LAST  366        4312  3 4215 C           CAF     PINSUPBT
 25462                              4313  0 0006 1           EXTEND
 25463  REF    8  LAST  366        4314  01 007 1           WRITE   SUPERBNK
 2547   REF    1                  4315  0 3406 C           TC      BLNKSUB1

 2548   REF   60  LAST  366        0777                     EBANK=  DSPCOUNT
 25481  REF    2  LAST  366        4316   60101 1  BLNKBBNK BBCON   BLNKSUB1
 2549                              4317            ENDBLFF  EQUALS

 2550   REF    1                 40,3406                    SETLOC  ENDRELOS
 25505  REF    8 LAST  358 TC  362:    35   774*           COUNT   40/PIN
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2551   REF  61  LAST  366   40,3406  3 0777 C  BLNKSUB1 CA    DSPCOUNT      SAVE OLD DSPCOUNT FOR LATER RESTORATION
25511  REF  41  LAST  366   40,3407  54 132 C            TS    BUF     +2
25512  REF  32  LAST  358   40,3410  3 4712 1            CAF   BIT1        TEST BIT1. SEE IF R1 TO BE BLANKED.
2552   REF   1               40,3411  0 3430 C            TC    TESTBIT
2553   REF  13  LAST  350   40,3412  3 4333 C            CAF   R1D1
2554   REF   4  LAST  330   40,3413  0 2436 1            TC    5BLANK -1
2555   REF  20  LAST  217   40,3414  3 4711 1            CAF   BIT2        TEST BIT 2. SEE IF R2 TO BE BLANKED.
2556   REF   2  LAST  367   40,3415  0 3430 C            TC    TESTBIT
2557   REF   5  LAST  352   40,3416  3 4334 1            CAF   R2D1
2558   REF   5  LAST  367   40,3417  0 2436 1            TC    5BLANK -1
2559   REF  15  LAST  360   40,3420  3 4710 C            CAF   BIT3        TEST BIT3. SEE IF R3 TO BE BLANKED.
2560   REF   3  LAST  367   40,3421  0 3430 C            TC    TESTBIT
2561   REF   5  LAST  331   40,3422  3 4335 C            CAF   R3D1
2562   REF   6  LAST  367   40,3423  0 2436 1            TC    5BLANK -1
2563   REF  42  LAST  367   40,3424  3 0132 1            CA    BUF     +2  RESTORE DSPCOUNT TO STATE IT HAD
2564   REF  62  LAST  367   40,3425  54 777 1            TS    DSPCOUNT        BEFORE BLANKSUB.
2565   REF  43  LAST  367   40,3426  52 131 C            DXCH  BUF         CALL L+2 DIRECTLY.
2566   REF   2  LAST  362   40,3427  0 5123 1            TC    SUPDXCHZ +1 DTCB WITH SUPERBIT SWITCHING

2567   REF   8  LAST  366   40,3430  7 0123 C  TESTBIT  MASK  NVTEMP       NVTEMP CONTAINS BLANKING CODE.
2568   REF 118  LAST  366   40,3431  10 000 C            CCS   A
2569   REF 115  LAST  366   40,3432  0 0002 C            TC    Q           IF CURRENT BIT = 1, RETURN TO L+1.
2570   REF 116  LAST  367   40,3433  50 002 C            INDEX Q           IF CURRENT BIT = 0, RETURN TO L+3.
2571                        40,3434  0 0002 C            TC    2
2572                        40,3435                      ENDBSUB1 EQUALS

R2572C5 DSPMM DOES NOT DISPLAY MODREG DIRECTLY. IT PUTS IN EXEC REQUEST WITH
R2572C6 PRIO 30000 FOR DSPMMJB AND RETURNS TO CALLER.

R2572C7 IF MODREG CONTAINS -0, DSPMMJB BLANKS THE MODE LIGHTS.

R2572C9 DSPMM MUST BE IN BANK 27 OR LOWER, SO IT CAN BE CALLED VIA BANKCALL.

25721                       07,2440                      BANK  7
257215 REF   1              04,2000                      SETLOC PINBALL4
257217                      04,2537                      BANK

257218 REF   1                                           COUNT 07/PIN

25722  REF 117  LAST  367   04,2537  56 002 C  DSPMM    XCH   Q
25723  REF 205  LAST  364   04,2540  54 154 C            TS    MPAC
25724                       04,2541  0 0004 C            INHINT
25725  REF   3  LAST  348   04,2542  3 4371 C            CAF   CHRPRIO
25726  REF  12  LAST  348   04,2543  0 5027 1            TC    NOVAC
25727  REF  63  LAST  367     0777                       EBANK= DSPCOUNT
25728  REF   1              04,2544   03435 C           2CADR DSPMMJB
25728  REF   1              04,2545   60101 1
257285                      04,2546  0 0003 1            RELINT
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 25725  REF 206  LAST  367   04,2547  0 0154 1  ENDSPMM  TC      MPAC

R2573   DSPMM  PLACE MAJOR MODE CODE INTO MODREG

 25735  REF   1                40,3435                    SETLOC ENDBSUB1

 25736  REF   9 LAST  366 TO  367:     23   7574          COUNT  40/PIN

 2574   REF   1                40,3435  3 4376 1  DSPMMJB  CAF    MD1          GETS HERE THRU DSPMM
 2575   REF  64  LAST  367     40,3436  56 777 C           XCH    DSPCOUNT
 2576   REF   1                40,3437  54 140 C           TS     DSPMMTEM     SAVE DSPCOUNT
 2579   REF   6  LAST  254     40,3440  11*011 1           CCS    MODREG
 2580   REF  47  LAST  362     40,3441  6 4712 1           AD     ONE
 25801  REF   4  LAST  353     40,3442  0 3211 C           TC     DSPDECVN     IF MODREG IS + OR +0, DISPLAY MODREG
 25802                         40,3443  0 3445 1           TC     +2           IF MODREG IS -NZ, DO NOTHING
 25803  REF   6  LAST  357     40,3444  0 2502 1           TC     2BLANK       IF MODREG IS -0, BLANK MM
 2581   REF   2  LAST  368     40,3445  56 140 1           XCH    DSPMMTEM     RESTORE DSPCOUNT
 2582   REF  65  LAST  368     40,3446  54 777 1           TS     DSPCOUNT
 2583   REF  41  LAST  365     40,3447  0 5112 C           TC     ENDOFJOB


R2584   RECALTST IS ENTERED DIRECTLY AFTER DATA IS LOADED (OR RESEQUENCE VERB IS
R2585   EXECUTED), TERMINATE VERB IS EXECUTED, OR PROCEED WITHOUT DATA VERB IS
R2586   EXECUTED. IT WAKES UP JOB THAT DID TC ENDIDLE.

R2587   IF CADRSTOR NOT= +0, IT PUTS +0 INTO DSPLOCK, AND TURNS OFF KEY RLSE
R2588   LIGHT IF DSPLIST IS EMPTY (LEAVES KEY RLSE LIGHT ALONE IF NOT EMPTY).

 2589   REF   9  LAST  365     40,3450  11*042 1  RECALTST CCS    CADRSTOR
 2590   REF   1                40,3451  0 3453 C           TC     RECALI
 2591   REF  42  LAST  368     40,3452  0 5112 C           TC     ENDOFJOB     NORMAL EXIT IF KEYBOARD INITIATED
 2592   REF  76  LAST  364     40,3453  3 4714 1  RECALI   CAF    ZERO
 2593   REF  10  LAST  368     40,3454  57*042 C           XCH    CADRSTOR
 2594                          40,3455  0 0004 C           INHINT
 2595   REF   1                40,3456  0 5074 1           TC     JOBWAKE
 2596   REF   4  LAST  364     40,3457  11*014 1           CCS    LOADSTAT
 2597   REF   1                40,3460  0 3502 C           TC     DOPROC       + PROCEED WITHOUT DATA
 2598   REF  43  LAST  368     40,3461  0 5112 C           TC     ENDOFJOB     PATHALOGICAL CASE EXIT
 2599   REF   1                40,3462  0 3500 1           TC     DOTERM       -   TERMINATE
 2600   REF  22  LAST  359     40,3463  3 4711 1           CAF    TWO          -0 DATA IN CR RESEQUENCE
 2601   REF   1                40,3464  50 064 C  RECAL2   INDEX  LOCCTR
 2602   REF   1                40,3465  6 0164 1           AD     LOC          LOC IS + FOR BASIC JOBS
 2603   REF   2  LAST  368     40,3466  50 064 C           INDEX  LOCCTR
 2604   REF   2  LAST  368     40,3467  54 164 C           TS     LOC
 26041  REF  15  LAST  363     40,3470  3 1002 1           CA     NOUNREG      SAVE VERB IN MPAC, NOUN IN MPAC+1 AT
 26042  REF  42  LAST  365     40,3471  54 001 1           TS     L            TIME OF RESPONSE TO ENDIDLE FOR
 26043  REF  20  LAST  363     40,3472  3 1001 1           CA     VERBREG      POSSIBLE LATER TESTING BY JOB THAT HAS
 26044  REF   3  LAST  368     40,3473  50 064 C           INDEX  LOCCTR       BEEN WAKED UP.
 26045  REF 207  LAST  368     40,3474  52 155 1           DXCH   MPAC
 2605                          40,3475  0 0003 1           RELINT
```

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2606    REF   8  LAST  36C   40,3476  0 4473 C  RECAL3   TC     RELDSP
2607    REF  44  LAST  368   40,3477  0 5112 C            TC     ENDOFJOB

2608    REF  77  LAST  368   40,3500  3 4714 1  DOTERM   CAF    ZERO
2609    REF   1              40,3501  0 3464 1            TC     RECAL2

2610    REF  48  LAST  368   40,3502  3 4712 1  DOPROC   CAF    ONE
2611    REF   2  LAST  369   40,3503  0 3464 1            TC     RECAL2
```

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 2613   REF    1                    4317                          SETLOC ENDBLFF

 2613$  REF    5 LAST  364 TO  366:    63   111*                  COUNT  02/PIN

R2614   SETNCADR        E CADR ARRIVES IN A. IT IS STORED IN NOUNCADR. EBANK BITS
R2615                   ARE SET. E ADRES IS DERIVED AND PUT INTO NOUNADD.

 2616   REF    8  LAST  350      4317  55*017 1  SETNCADR TS     NOUNCADR      STORE ECADR
 2617   REF   16  LAST  294      4320  54 003 C             TS     EBANK         SET EBANK BITS
 2618   REF    1                4321  7 4373 C             MASK   LOW8
 2619   REF    1                4322  6 4744 1             AD     OCT1400
 2620   REF   29  LAST  345      4323  54 145 C             TS     NOUNADD       PUT E ADRES INTO NOUNADD
 2621   REF  118  LAST  367      4324  0 0002 C             TC     Q

R2622   SETNADD         GETS E CADR FROM NOUNCADR, SETS EBANK BITS, DERIVES
R2623                   E ADRES AND PUTS IT INTO NOUNADD.

 2624   REF    9  LAST  370      4325  3 1017 C  SETNADD   CA     NOUNCADR
 2625   REF    7  LAST  339      4326  1 4320 C             TCF    SETNCADR +1

R2626   SETEBANK        E CADR ARRIVES IN A. EBANK BITS ARE SET. E ADRES IS
R2627                   DERIVED AND LEFT IN A.

 2628   REF   17  LAST  370      4327  54 003 C  SETEBANK  TS     EBANK         SET EBANK BITS
 2629   REF    2  LAST  370      4330  7 4373 C             MASK   LOW8
 2630   REF    2  LAST  370      4331  6 4744 1             AD     OCT1400       E ADRES LEFT IN A
 2631   REF  119  LAST  370      4332  0 0002 C             TC     Q

 2632                            4333   00016 C  R1D1      OCT    16            THESE 3 CONSTANTS FORM A PACKED TABLE.
 2633                            4334   00011 1  R2D1      OCT    11            DONT SEPARATE.
 2634                            4335   00004 0  R3D1      OCT    4

 2635   REF    7  LAST  354      4336  54 020 1  RIGHTS   TS     CYR
 2636   REF    8  LAST  370      4337  4 0020 1           CS     CYR
 2637   REF    9  LAST  370      4340  4 0020 1           CS     CYR
 2638   REF   10  LAST  370      4341  4 0020 1           CS     CYR
 2639   REF   11  LAST  370      4342  4 0020 1           CS     CYR
 2640   REF   12  LAST  370      4343  56 020 C           XCH    CYR
 2641   REF  120  LAST  370      4344  0 0002 C           TC     Q

 2642   REF   13  LAST  354      4345  54 022 C  LEFTS    TS     CYL
 2643   REF   14  LAST  370      4346  4 0022 C           CS     CYL
 2644   REF   15  LAST  370      4347  4 0022 C           CS     CYL
 2645   REF   16  LAST  370      4350  4 0022 C           CS     CYL
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2646   REF  17  LAST  370     4351  4 0022 C            CS      CYL
2647   REF  18  LAST  371     4352  56 022 1            XCH     CYL
2648   REF 121  LAST  37C     4353  0 0002 C            TC      Q

2649                           4354  6 0000 1  SLEFTS     DOUBLE
2650                           4355  6 0000 1            DOUBLE
2651                           4356  6 0000 1            DOUBLE
2652                           4357  6 0000 1            DOUBLE
2653                           4360  6 0000 1            DOUBLE
2654   REF 122  LAST  371      4361  0 0002 C            TC      Q


2655                           4362   00037 C  LOW5       OCT     37          THESE 3 CONSTANTS FORM A PACKED TABLE.
2656                           4363   01740 C  MID5       OCT     1740        DONT SEPARATE.
2657                           4364   76000 C  HI5        OCT     76000       MUST STAY HERE

2658   REF  13  LAST  367     4365  0 5027 1  TCNOVAC     TC      NOVAC
2659   REF  12  LAST  348     4366  0 5140 1  TCWAIT      TC      WAITLIST
2660   REF  14  LAST  348     4367  0 5213 1  TCTSKOVR    TC      TASKOVER
2661   REF  13  LAST  26C     4370  0 5042 1  TCFINDVC    TC      FINDVAC


2662                           4371   30000 1  CHRPRIO     OCT     30000       EXEC PRIORITY OF CHARIN

2663                           4372   03777 C  LOW11       OCT     3777
2664   REF   6  LAST  339     4372            B12-1       EQUALS  LOW11
2665                           4373   00377 1  LOW8        OCT     377


2667                           4374   00023 C  VD1         OCT     23          THESE 3 CONSTANTS FORM A PACKED TABLE.
2668                           4375   00021 1  ND1         OCT     21          DONT SEPARATE.
2669                           4376   00025 C  MD1         OCT     25

2670                           4377   00012 1  BINCON      DEC     10

2671   REF  28  LAST  315     4400  3 4704 C  FALTON      CA      BIT7        TURN ON OPERATOR ERROR LIGHT
2672                           4401  0 0006 1             EXTEND
2673   REF  11  LAST  36C     4402  05 011 1             WOR     DSALMOUT    BIT 7 OF CHANNEL 11
2674   REF 123  LAST  371     4403  0 0002 C             TC      Q

2675   REF  29  LAST  371     4404  4 4704 1  FALTOF      CS      BIT7        TURN OFF OPERATOR ERROR LIGHT
2676                           4405  0 0006 1             EXTEND
2677   REF  12  LAST  371     4406  03 011 1             WAND    DSALMOUT    BIT 7 OF CHANNEL 11
2678   REF 124  LAST  371     4407  0 0002 C             TC      Q

2679   REF  17  LAST  357     4410  3 4706 1  RELDSPCN    CAF     BIT5        TURN ON KEY RELEASE LIGHT
2680                           4411  0 0006 1             EXTEND
2681   REF  13  LAST  371     4412  05 011 1             WOR     DSALMOUT    BIT 5 OF CHANNEL 11
2682   REF 125  LAST  371     4413  0 0002 C             TC      Q
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2683                              4414  0 0006 1  LODSAMPT EXTEND
2684  REF  10  LAST  269         4415  3 0025 0           DCA     TIME2
2685  REF   5  LAST  274         4416  52 014 0           DXCH    SAMPTIME
2686  REF 126  LAST  371         4417  0 0002 0           TC      Q


2687                              4420  0 0006 1  TPSL1    EXTEND                    SHIFTS MPAC, +1, +2 LEFT 1
2688  REF 208  LAST  368          4421  3 0156 0           DCA     MPAC     +1       LEAVES OVFIND SET TO +/- 1 FOR OF/UF
2689  REF 209  LAST  372          4422  20 156 1           DAS     MPAC     +1
2690  REF 210  LAST  372          4423  6 0154 1           AD      MPAC
2691  REF 211  LAST  372          4424  26 154 0           ADS     MPAC
2692                              4425  54 007 1           TS      7                 TS A DOES NOT CHANGE A ON OF/UF.
2693  REF 127  LAST  372          4426  0 0002 0           TC      Q                 NO NET OF/UF
2694  REF   7  LAST  344          4427  54 162 0           TS      MPAC+6            MPAC +6 SET TO +/-1 FOR OF/UF
2695  REF 128  LAST  372          4430  0 0002 0           TC      Q


R2696   IF MPAC, +1 ARE EACH +NZ OR +0 AND C(A)=-0, SHORTMP WRONGLY GIVES +0.
R2697   IF MPAC, +1 ARE EACH -NZ OR -0 AND C(A)=+0, SHORTMP WRONGLY GIVES +0.
R2698   PRSHRTMP FIXES FIRST CASE ONLY, BY MERELY TESTING C(A) AND IF IT = -0,
R2699   SETTING RESULT TO -0.
R2700    (DO NOT USE PRSHRTMP UNLESS MPAC, +1 ARE EACH +NZ OR +0, AS THEY ARE
R2701    WHEN THEY CONTAIN TH E SF CONSTANTS.)

2702  REF   2  LAST   67          4431  54 135 1  PRSHRTMP TS      MPTEMP
2703  REF 119  LAST  367          4432  10 000 0           CCS     A
2704  REF   3  LAST  372          4433  3 0135 0           CA      MPTEMP            C(A) +, DO REGULAR SHORTMP
2705  REF   8  LAST  351          4434  1 7257 1           TCF     SHORTMP +1        C(A) +0, DO REGULAR SHORTMP
2706                              4435  1 4433 0           TCF     -2                C(A) -, DO REGULAR SHORTMP
2707  REF  78  LAST  369          4436  4 4714 0           CS      ZERO              C(A) -0, FORCE RESULT TO -0 AND RETURN.
2708  REF 212  LAST  372          4437  54 154 0           TS      MPAC
2709  REF 213  LAST  372          4440  54 155 1           TS      MPAC     +1
2710  REF 214  LAST  372          4441  54 156 1           TS      MPAC     +2
2711  REF 129  LAST  372          4442  0 0002 0           TC      Q


2712  REF  27  LAST  290          4443  3 4705 1  FLASHON  CAF     BIT6              TURN ON V/N FLASH
2713                              4444  0 0006 1           EXTEND                    BIT 6 OF CHANNEL 11
2714  REF  14  LAST  371          4445  05 011 1           WOR     DSALMOUT
2715  REF 130  LAST  372          4446  0 0002 0           TC      Q


2716  REF  28  LAST  372          4447  4 4705 0  FLASHOFF CS      BIT6              TURN OFF V/N FLASH
2717                              4450  0 0006 1           EXTEND
2718  REF  15  LAST  372          4451  03 011 1           WAND    DSALMOUT          BIT 6 OF CHANNEL 11
2719  REF 131  LAST  372          4452  0 0002 0           TC      Q
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P2720 INTERNAL USE OF KEYBOARD AND DISPLAY PROGRAM

R2721 USER MUST SCHEDULE CALLS TO NVSUB SO THAT THERE IS NO CONFLICT OF USE OR
R2722 CONFUSION TO OPERATOR. THE OLD GRABLOCK (INTERNAL/INTERNAL INTERLOCK)
R2723 HAS BEEN REMOVED AND THE INTERNAL USER NO LONGER HAS THE PROTECTION THIS
R2724 OFFERED.

R2725 THERE ARE TWO WAYS A JOB CAN BE PUT TO SLEEP BY THE KEYBOARD + DISPLAY
R2726 PROGRAM. 1) BY ENDIDLE
R2727 2) BY NVSUBUSY
R2728 THE BASIC CONVENTION IS THAT ONLY ONE JOB WILL BE PERMITTED ASLEEP VIA
R2729 THE KEYBOARD + DISPLAY PROGRAM AT A TIME. IF A JOB ATTEMPTS TO GO TO
R2730 SLEEP BY MEANS OF (1) OR (2) AND THERE IS ALREADY A JOB ASLEEP THAT WAS
R2731 PUT TO SLEEP BY (1) OR (2), THEN AN ABORT IS CAUSED.

R2732 THE CALLING SEQUENCE FOR NVSUB IS
R2733 CAF V/N
R2734 L TC NVSUB
R2735 L+1 RETURN HERE IF OPERATOR HAS INTERVENED
R2736 L+2 RETURN HERE AFTER EXECUTION

R2737 A ROUTINE CALLED NVSUBUSY IS PROVIDED (USE IS OPTIONAL) TO PUT
R2738 YOUR JOB TO SLEEP UNTIL THE OPERATOR RELEASES THE KEYBOARD + DISPLAY
R2739 SYSTEM. NVSUBUSY ALSO TURNS ON THE KEY RELEASE LIGHT.
R2740 NVSUBUSY CANNOT BE CALLED FROM ERASABLE OR F/F MEMORY,
R2741 SINCE JOBSLEEP AND JOBWAKE CAN HANDLE ONLY FIXED BANKS.

R2742 THE CALLING SEQUENCE IS
R2743 CAF WAKEFCADR
R2744 TC NVSUBUSY

R2745 .

R2746 NVSUBUSY IS INTENDED FOR USE WHEN AN INTERNAL PROGRAM FINDS THE OPERATOR
R2747 IS USING THE KEYBOARD + DISPLAY PROGRAM (BY HIS OWN INITIATION). IT IS
R2748 NOT INTENDED FOR USE WHEN ONE INTERNAL PROGRAM FINDS ANOTHER INTERNAL
R2749 PROGRAM USING THE KEYBOARD + DISPLAY PROGRAM.

R2750 NVSUBUSY ABORTS (WITH CODE 01206) IF A SECOND JOB ATTEMPTS TO GO TO
R2751 SLEEP IN PINBALL. IN PARTICULAR, IF AN ATTEMPT IS MADE TO GO TO NVSUBUSY
R2752 WHEN
R2753 1) DSPLIST NOT= +0. THIS IS THE CASE WHERE THE CAPACITY OF THE DSPLIST
R2754 IS EXCEEDED.
R2755 2) CADRSTOR NOT= +0. THIS INDICATES THAT A JOB IS ALREADY USING

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R2756   ENDIDLE. (+-NZ INDICATE A JOB IS ALREADY ASLEEP DUE TO ENDIDLE.)

 2757   REF   1                    4453  4 4460 C  PRENVBSY CS     2K+3          SPECIAL ENTRANCE FOR ROUTINES IN FIXED
 2758   REF 132  LAST  372         4454  6 0002 C           AD     Q             BANKS ONLY DESIRING THE FCADR OF(LOC
 2759   REF   2  LAST  365         4455  6 0004 C           AD     FBANK         FROM WHICH THE TC PRENVBSY WAS DONE) -2
 2760   REF  32  LAST  366         4456  0 4574 C  NVSUBUSY TC     POSTJUMP      TO BE ENTERED.
 2761   REF   1                    4457  10550 C            CADR   NVSUBSY1
 2762                              4460  02003 C  2K+3      OCT    2003

R27625  NVSUBSY1 MUST BE IN BANK 27 OR LOWER, SO IT WILL PUT CALLER TO SLEEP
R27626  WITH HIS PROPER SUPERBITS.

 2763   REF   1                   04,2550                   SETLOC ENDSPNM +1
27635   REF   2 LAST  367 TO  368:     9      9*            COUNT  07/PIN

 2764   REF  43  LAST  368         04,2550  54 001 1  NVSUBSY1 TS     L
 2769   REF   2  LAST  365         04,2551  0 4234 C           TC     ISCADR+0      ABORT IF CADRSTOR NOT= +0.
 2770   REF   2  LAST  365         04,2552  0 4240 C           TC     ISLIST+0      ABORT IF DSPLIST NOT= +0.
 2771   REF   3  LAST  350         04,2553  0 4410 C           TC     RELDSPCN
 2772   REF  44  LAST  374         04,2554  3 0001 C           CA     L
 2773   REF   3  LAST  365         04,2555  55*043 C           TS     DSPLIST
 2774   REF   2  LAST  365         04,2556  0 5070 C  ENDNVBSY TC     JOBSLEEP

R2775   NVSBWAIT IS A SPECIAL ENTRANCE FOR ROUTINES IN FIXED BANKS ONLY. IF
R2776   SYSTEM IS NOT BUSY, IT EXECUTES V/N AND RETURNS TO L+1 (L= LOC FROM
R2777   WHICH THE TC NVSBWAIT WAS DONE). IF SYSTEM IS BUSY, IT PUTS CALLING JOB
R2778   TO SLEEP WITH L-1 GOING INTO LIST FOR EVENTUAL WAKING UP WHEN SYSTEM
R2779   IS NOT BUSY.

 2780   REF   1                    4461                      SETLOC NVSUBUSY +3
27805   REF   6 LAST  370 TO  374:     98     209*          COUNT  02/PIN

 2781                              4461  22 007 C  NVSBWAIT LXCH   7             ZERO NVMONOPT OPTIONS
 2782   REF   9  LAST  367         4462  54 123 C           TS     NVTEMP
 2783   REF  33  LAST  366         4463  3 4675 1           CAF    BIT14
27831   REF  10  LAST  366         4464  7 1021 1           MASK   MONSAVE1       EXTERNAL MONITOR BIT
27832   REF   8  LAST  366         4465  6 1012 C           AD     DSPLOCK
27833   REF 120  LAST  372         4466  10 000 C           CCS    A
27834   REF   1                    4467  1 4471 C           TCF    NVSBWT1       BUSY
 2784   REF   1                    4470  1 4200 C           TCF    NVSBCON       FREE. NVSUB WILL SAVE L+1 FOR RETURN
A2785                                                                            AFTER EXECUTION.
 2786   REF 133  LAST  374         4471  24 002 C  NVSBWT1  INCR   Q             L+2. PRENVBSY WILL PUT L-1 INTO LIST AND
 2787   REF   1                    4472  1 4453 C           TCF    PRENVBSY      GO TO SLEEP.

R2788   RELDSP IS USED BY VBPROC, VBTERM, VBRQEXEC, VBRQWAIT, VBRELDSP, EXTENDED
R2789   VERB DISPATCHER, VBRESEQ, RECALTST.
R2790   RELDSP1 IS USED BY MONITOR SET UP, VBRELDSP.
 2791   REF 134  LAST  374         4473  56 002 C  RELDSP   XCH    Q             SET DSPLOCK TO +0, TURN RELDSP LIGHT
```

```
 2792   REF   1                    4474   54 144 1          TS      RELRET      OFF,  SEARCH DSPLIST
 27921  REF  34  LAST  374         4475   4 4675 C          CS      BIT14
 27922                             4476   0 0004 C          INHINT
 27923  REF  11  LAST  374         4477   7 1021 1          MASK    MONSAVE1
 27924  REF  12  LAST  375         4500   55*021 1          TS      MONSAVE1    TURN OFF EXTERNAL MONITOR BIT
 2793   REF   4  LAST  374         4501   11*043 C          CCS     DSPLIST
 2794                              4502   0 4504 1          TC      +2
 2795   REF   1                    4503   0 4507 1          TC      RELDSP2     LIST EMPTY
 2796   REF  79  LAST  372         4504   3 4714 1          CAF     ZERO
 2797   REF   5  LAST  375         4505   57*043 1          XCH     DSPLIST
 2799   REF   2  LAST  368         4506   0 5074 1          TC      JOBWAKE
 2800                              4507   0 0003 1  RELDSP2 RELINT
 2801   REF  18  LAST  371         4510   4 4706 C          CS      BIT5        TURN OFF KEY RELEASE LIGHT
 2802                              4511   0 0006 1          EXTEND              (BIT 5 OF CHANNEL 11)
 2803   REF  16  LAST  372         4512   03 011 1          WAND    DSALMOUT
 2804   REF  80  LAST  375         4513   3 4714 1          CAF     ZERO
 2805   REF   9  LAST  374         4514   55*012 1          TS      DSPLOCK
 2807   REF   2  LAST  375         4515   0 0144 C          TC      RELRET
 2808   REF 135  LAST  374         4516   56 002 C  RELDSP1 XCH     Q           SET DSPLOCK TO +0. NO DSPLIST SEARCH.
 2809   REF   3  LAST  375         4517   54 144 1          TS      RELRET      TURN KEY RLSE LIGHT OFF IF DSPLIST IS
A2810                                                                           EMPTY. LEAVE KEY RLSE LIGHT ALONE IF
A2811                                                                           DSPLIST IS NOT EMPTY.
 2812   REF   6  LAST  375         4520   11*043 C          CCS     DSPLIST
 2813                              4521   0 4523 1          TC      +2          +  NOT EMPTY. LEAVE KEY RLSE LIGHT ALONE
 2814   REF   2  LAST  375         4522   0 4507 1          TC      RELDSP2     +0 EMPTY. TURN OFF KEY RLSE LIGHT
 2815   REF  81  LAST  375         4523   3 4714 1          CAF     ZERO        -  NOT EMPTY. LEAVE KEY RLSE LIGHT ALONE
 2816   REF  10  LAST  375         4524   55*012 1          TS      DSPLOCK
 2817   REF   4  LAST  375         4525   0 0144 C          TC      RELRET

 2818                              4526                ENDPINBF EQUALS
```

L PINBALL GAME BUTTONS AND LIGHTS USER'S PAGE NO. 77 EO S4

P28181 PINTEST IS NEEDED FOR AUTO CHECK OF PINBALL.

28182 REF 2 LAST 229 43,2002 PINTEST EQUALS LST2FAN

L PINBALL GAME BUTTONS AND LIGHTS USER'S PAGE NO. 78 EO 54

P2819 VBTSTLTS TURNS ON ALL DISPLAY PANEL LIGHTS. AFTER 5 SEC, IT TURNS
R2820 OFF THE CAUTION AND STATUS LIGHTS.

```
 2821   REF    1                    41,3603                          SETLOC ENDNVSBI +1

 2821$  REF    8 LAST  362 TO  364:     61   899*                    COUNT  41/PIN

 2822                                41,3603   0 0004 C  VBTSTLTS INHINT
 2823   REF   33  LAST  367          41,3604   4 4712 C           CS     BIT1          SET BIT 1 OF IMODES33 SO IMUMON WONT
 2824   REF   20  LAST  182          41,3605   7 1321 1           MASK   IMODES33      TURN OUT ANY LAMPS.
 2825   REF   34  LAST  377          41,3606   6 4712 1           AD     BIT1
 2826   REF   21  LAST  377          41,3607   55'321 1           TS     IMODES33

 2827   REF    1                    41,3610   3 3644 1           CAF    TSTCON1       TURN ON UPLINK ACTIVITY, TEMP, KEY RLSE,
 2828                               41,3611   0 0006 1           EXTEND               V/N FLASH, OPERATOR ERROR.
 2829   REF   17  LAST  375          41,3612   05 011 1           WOR    DSALMOUT
 2830   REF    1                    41,3613   3 3645 C           CAF    TSTCON2       TURN ON NO ATT, GIMBAL LOCK, TRACKER,
 2831   REF   27  LAST  363          41,3614   55'036 1           TS     DSPTAB  +11D  PROG ALM.
 2832   REF   21  LAST  297          41,3615   3 4701 C           CAF    BIT1C         TURN ON TEST ALARM OUTBIT
 2833                               41,3616   0 0006 1           EXTEND
 2834   REF    3  LAST  189          41,3617   05 013 C           WOR    CHAN13
 2835   REF    3  LAST  310          41,3620   3 4377 C           CAF    TEN
 2836   REF    1                    41,3621   54 117 1  TSTLTS1  TS     ERCNT
 2837   REF    1                    41,3622   4 3642 C           CS     FULLDSP
 2838   REF    2  LAST  377          41,3623   50 117 C           INDEX  ERCNT
 2839   REF   28  LAST  377          41,3624   55'023 C           TS     DSPTAB
 2840   REF    3  LAST  377          41,3625   10 117 1           CCS    ERCNT
 2841   REF    1                    41,3626   0 3621 1           TC     TSTLTS1
 2842   REF    1                    41,3627   4 3643 1           CS     FULLDSP1
 2843   REF   29  LAST  377          41,3630   55'024 1           TS     DSPTAB  +1    TURN ON 3 PLUS SIGNS
 2844   REF   30  LAST  377          41,3631   55'027 1           TS     DSPTAB  +4
 2845   REF   31  LAST  377          41,3632   55'031 C           TS     DSPTAB  +6
 2846   REF    3  LAST  198          41,3633   3 4717 1           CAF    ELEVEN
 2847   REF    9  LAST  363          41,3634   55'016 C           TS     NOUT
 2849   REF    1                    41,3635   3 3647 1           CAF    SHOLTS
 2851   REF   13  LAST  371          41,3636   0 5140 1           TC     WAITLIST
 2852   REF   32  LAST  377             1023                     EBANK= DSPTAB
 2853   REF    1                    41,3637    03650 1           2CADR  TSTLTS2
 2853   REF    1                    41,3640    62102 C
 2854   REF   45  LAST  369          41,3641   0 5112 C           TC     ENDOFJOB      DSPLOCK IS LEFT BUSY (FROM KEYBOARD
A2855                                                                                  ACTION) UNTIL TSTLTS3 TO INSURE THAT
A2856                                                                                  LIGHTS TEST WILL BE SEEN.


 2857                               41,3642    05675 C  FULLDSP  OCT    05675         DISPLAY ALL 8:S
 2858                               41,3643    07675 1  FULLDSP1 OCT    07675         DISPLAY ALL 8:S AND +
 2859                               41,3644    00175 1  TSTCON1  OCT    00175
A2860                                                                                  UPLINK ACTIVITY, TEMP, KEY RLSE,
A2861                                                                                  V/N FLASH, OPERATOR ERROR.
 2862                               41,3645    40650 C  TSTCON2  OCT    40650         DSPTAB+11D  BITS 4,6,8,9.
```

```
A2863                                                                   NO ATT, GIMBAL LOCK, TRACKER, PROG ALM.
 2864                        41,3646   00115 1  TSTCON3  OCT     00115    CHAN 11  BITS 1, 3, 4, 7.
A2865                                                                   UPLINK ACTIVITY, TEMP, OPERATOR ERROR.
 2866                        41,3647   00764 1  SHOLTS   OCT     764      5 SEC


 2867  REF   4  LAST  367   41,3650  3 4371 0  TSTLTS2  CAF     CHRPRIO  CALLED BY WAITLIST
 2868  REF  14  LAST  371   41,3651  0 5027 1           TC      NOVAC
 2869  REF  33  LAST  377      1023                    EBANK=  DSPTAB
 2870  REF   1               41,3652   03655 1         2CADR   TSTLTS3
 2870  REF   1               41,3653   62102 0
 2871  REF  15  LAST  371   41,3654  0 5213 1           TC      TASKOVER


 2872  REF   1               41,3655  4 3646 1  TSTLTS3  CS      TSTCON3  CALLED BY EXECUTIVE
 2873                        41,3656  0 0004 0           INHINT
 2874                        41,3657  0 0006 1           EXTEND           TURN OFF  UPLINK ACTIVITY, TEMP,
 2875  REF  18  LAST  377   41,3660  03 011 1           WAND    DSALMOUT OPERATOR ERROR.
 2876  REF  22  LAST  377   41,3661  4 4701 1           CS      BIT10    TURN OFF TEST ALARM OUTBIT
 2877                        41,3662  0 0006 1           EXTEND
 2878  REF   4  LAST  377   41,3663  03 013 0           WAND    CHAN13
28781  REF  22  LAST  295   41,3664  3 4707 0           CAF     BIT4     MAKE NO ATT FOLLOW BIT 4 OF CHANNEL 12
28782                        41,3665  0 0006 1           EXTEND             (NO ATT LIGHT ON IF IN COARSE ALIGN)
28783  REF  23  LAST  242   41,3666  02 012 0           RAND    CHAN12
 2879  REF  27  LAST  364   41,3667  6 4674 0           AD      BIT15    TURN OFF AUTO, HOLD, FREE, SPARE,
 2880  REF  34  LAST  378   41,3670  55*036 1           TS      DSPTAB +11D  GIMBAL LOCK, SPARE, TRACKER, PROG ALM
 2881  REF   1               41,3671  4 3710 0           CS      13-11,1  SET BITS TO INDICATE ALL LAMPS OUT. TEST
 2882  REF  22  LAST  377   41,3672  7 1321 1           MASK    IMODES33 LIGHTS COMPLETE.
 2883  REF   7  LAST  250   41,3673  6 4763 1           AD      PRIO16
 2884  REF  23  LAST  378   41,3674  55*321 1           TS      IMODES33

 2885  REF   1               41,3675  4 3711 1           CS      OCT55000
 2886  REF  38  LAST  192   41,3676  7 1320 0           MASK    IMODES30
 2887  REF   2  LAST  154   41,3677  6 4762 0           AD      PRIO15   15000.
 2888  REF  39  LAST  378   41,3700  55*320 0           TS      IMODES30

 2893                        41,3701  0 0003 1           RELINT

 2894  REF  53  LAST  357   41,3702  0 4555 0           TC      BANKCALL REDISPLAY C(MODREG)
 2895  REF   1               41,3703   10537 1         CADR    DSPMM
 2896  REF   4  LAST  362   41,3704  0 4220 0           TC      KILMONON TURN ON KILL MONITOR BIT.
 2897  REF   5  LAST  363   41,3705  0 4447 1           TC      FLASHOFF TURN OFF V/N FLASH.
 2898  REF  33  LAST  374   41,3706  0 4574 0           TC      POSTJUMP DOES RELDSP AND GOES TO PINBRNCH IF
 2899  REF   1               41,3707   61372 0         CADR    TSTLTS4   ENDIDLE IS AWAITING OPERATOR RESPONSE.
 2901                        41,3710   16001 1  13-11,1  OCT     16001
 2903                        41,3711   55000 1  OCT55000 OCT     55000
 2904                        41,3712            ENDPINS2 EQUALS
```

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P2905 ERROR LIGHT RESET (RSET) TURNS OFF,
R2906 UPLINK ACTIVITY, AUTO, HOLD, FREE, OPERATOR ERROR,
R2907 PROG ALM, TRACKER FAIL.
R2908 LEAVES GIMBAL LOCK AND NO ATT ALONE.
R2909 IT ALSO ZEROES THE :TEST ALARM: OUT BIT, WHICH TURNS OFF STBY,RESTART.
R2910 IT ALSO SETS :CAUTION RESET: TO 1.
R2911 IT ALSO FORCES BIT 12 OF ALL DSPTAB ENTRIES TO 1.

```
 2912   REF   2 LAST  368   40,3504                        SETLOC DOPROG  +2
 29125  REF  10 LAST  368 TO  370:    39   836*           COUNT  40/PIN

 2913   REF   3 LAST  360   40,3504  56 115 1  ERROR     XCH    21/22REG   RESTORE ORIGINAL C(DSPLOCK). THUS ERROR
 2914   REF  11 LAST  375   40,3505  55'012 1             TS     DSPLOCK    LIGHT RESET LEAVES DSPLOCK UNCHANGED.
 2915                       40,3506  0 0004 0             INHINT
 2916   REF  23 LAST  378   40,3507  3 4701 0             CAF    BIT10      TURN ON :CAUTION RESET: OUTBIT
 2917                       40,3510  0 0006 1             EXTEND
 2918   REF  19 LAST  378   40,3511  05 011 1             WOR    DSALMOUT   BIT10 CHAN 11
 2919   REF   1             40,3512  3 3567 0             CAF    GL+NOATT   LEAVE GIMBAL LOCK AND NO ATT INTACT,
 2920   REF  35 LAST  378   40,3513  7 1036 1             MASK   DSPTAB +110 TURNING OFF AUTO, HOLD, FREE,
 2921   REF  28 LAST  378   40,3514  6 4674 0             AD     BIT15      PROG ALARM, AND TRACKER.
 2922   REF  36 LAST  379   40,3515  55'036 1             TS     DSPTAB +110
 2923   REF   8 LAST  378   40,3516  4 4763 0             CS     PRIO16     RESET FAIL BITS WHICH GENERATE PROG
 2924   REF  24 LAST  378   40,3517  7 1321 1             MASK   IMODES33   ALARM SO THAT IF THE FAILURE STILL
 2925   REF   9 LAST  379   40,3520  6 4763 1             AD     PRIO16     EXISTS, THE ALARM WILL COME BACK.
 2926   REF  25 LAST  379   40,3521  55'321 1             TS     IMODES33
 2927   REF  24 LAST  379   40,3522  4 4701 1             CS     BIT10
 2928   REF  40 LAST  378   40,3523  7 1320 0             MASK   IMODES30
 2929   REF  25 LAST  379   40,3524  6 4701 0             AD     BIT10
 2930   REF  41 LAST  379   40,3525  55'320 0             TS     IMODES30

 2935   REF  26 LAST  379   40,3526  4 4701 1             CS     BIT10      TURN OFF :TEST ALARM: OUTBIT.
 2936                       40,3527  0 0006 1             EXTEND
 2937   REF   5 LAST  378   40,3530  03 013 0             WAND   CHAN13
 2938   REF   1             40,3531  4 3565 0             CS     ERCON      TURN OFF UPLINK ACTIVITY,
 2939                       40,3532  0 0006 1             EXTEND             OPERATOR ERROR.
 2940   REF  20 LAST  379   40,3533  03 011 1             WAND   DSALMOUT
 2941   REF   2 LAST  351   40,3534  3 4377 0  TSTAB      CAF    BINCON     (DEC 10)
 2942   REF   4 LAST  377   40,3535  54 117 1             TS     ERCNT      ERCNT = COUNT
 2943                       40,3536  0 0004 0             INHINT
 2944   REF   5 LAST  379   40,3537  50 117 0             INDEX  ERCNT
 2945   REF  37 LAST  379   40,3540  11'023 0             CCS    DSPTAB
 2946   REF  49 LAST  369   40,3541  6 4712 1             AD     ONE
 2947   REF   1             40,3542  0 3547 1             TC     ERPLUS
 2948   REF  50 LAST  379   40,3543  6 4712 1             AD     ONE
 2949   REF 121 LAST  374   40,3544  4 0000 0  ERMINUS     CS     A
 2950   REF   1             40,3545  7 3570 1             MASK   NOTBIT12
 2951   REF   1             40,3546  0 3552 0             TC     ERCON
 2952   REF 122 LAST  379   40,3547  4 0000 0  ERPLUS      CS     A
 2953   REF   2 LAST  379   40,3550  7 3570 1             MASK   NOTBIT12
 2954   REF 123 LAST  379   40,3551  4 0000 0             CS     A          MIGHT WANT TO RESET CLPASS, DECBRNCH,
```

```
 2955   REF   6  LAST  379   40,3552  50 117 C  ERCON    INDEX  ERCNT          ETC.
 2956   REF  38  LAST  379   40,3553  55*023 C           TS     DSPTAB
 2957                        40,3554  0 0003 1           RELINT
 2958   REF   7  LAST  380   40,3555  10 117 1           CCS    ERCNT
 2959   REF   1               40,3556  0 3535 1           TC     TSTAB   +1
 2960   REF  82  LAST  379   40,3557  3 4714 1           CAF    ZERO
 2961   REF   5  LAST  264   40,3560  54 375 1           TS     FAILREG
29611   REF   6  LAST  380   40,3561  54 376 1           TS     FAILREG +1
29612   REF   7  LAST  380   40,3562  54 377 C           TS     FAILREG +2
 2962   REF   2  LAST   79   40,3563  55*357 C           TS     SFAIL
 2963   REF  46  LAST  377   40,3564  0 5112 C           TC     ENDOFJOB

 2964                        40,3565   00104 1  ERCON     OCT    104            CHAN 11 BITS 3,7.
A2965                                                                          UPLINK ACTIVITY, AND OPERATOR ERROR.
 2966                        40,3566   00240 1  BITS6,8   OCT    240
29665                        40,3567   00050 1  GL+NOATT  OCT    00050          NO ATT AND GIMBAL LOCK LAMPS
 2967                        40,3570   73777 1  NOTBIT12  OCT    73777


 2968                        40,3571            ENDPINS1 EQUALS
```

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```
 1500                          34,2002                    BANK   34
 1501   REF   1                27,2000                    SETLOC MANUVER
 1502                          27,2000                    BANK

 1503   REF   1                  1146                     EBANK= TEMPR60

 1504   REF   1                                           COUNT  27/R60
R15041

R150411 R60CSM
R150413 REV 13   CONFORMS TO GSOP CHAPTER FOUR REVISION LOGIC  09  JAN 18,1968
R150415


 1505   REF   1                27,2000  0 4604 1  R60CSM  TC     MAKECADR
 1506   REF   2  LAST  381     27,2001  55'146 1           TS     TEMPR60

R1507          INSERT PRIODSP CHECK WITH R22 (V06N49)  WITH JENNINGS BRODEUR

 1510   REF  29  LAST  372     27,2002  3 4705 1  REDOMANN CAF    BIT6
 1511   REF   6  LAST  256     27,2003  7 0101 0           MASK   FLAGWRD5       IS 3-AXIS FLAG SET
 1512   REF 124  LAST  379     27,2004  10 000 0           CCS    A
 1513   REF   1                27,2005  1 2013 0           TCF    TOBALL         YES
 1514   REF   9  LAST  284     27,2006  0 6006 1           TC     INTPRET
 1515                          27,2007  77624 1            CALL
 1516   REF   1                27,2010  56126 1                   VECPOINT       TO COMPUTE FINAL ANGLES
 1517   REF   2  LAST  245     27,2011  01156 1            STORE  CPHI           STORE FINAL ANGLES - CPHI,CTHETA,CPSI
 1518                          27,2012  77776 1            EXIT

 1519   REF   1                27,2013  3 2125 0  TOBALL   CAF    V06N18
 1520   REF  54  LAST  378     27,2014  0 4555 0           TC     BANKCALL
 1521   REF   1                27,2015   21036 1           CADR   GOPERF2R        DISPLAY PLEASE PERFORM AUTO MANEUVER
 1522   REF   1                27,2016  0 2114 1           TC     R61TEST
 1523   REF   1                27,2017  0 2023 1           TC     REDOMANC       PROCEED
 1524   REF   1                27,2020  1 2052 0           TCF    ENDMANU1       ENTER I.E. FINISHED WITH R60

 1525   REF   1                27,2021  0 2056 0           TC     CHKLINUS       TO CHECK FOR PRIORITY DISPLAYS
 1526   REF  47  LAST  380     27,2022  0 5112 0           TC     ENDOFJOB

 1529   REF  30  LAST  381     27,2023  3 4705 1  REDOMANC CAF    BIT6
 1530   REF   7  LAST  381     27,2024  7 0101 0           MASK   FLAGWRD5       IS 3-AXIS FLAG SET
 1531   REF 125  LAST  381     27,2025  10 000 0           CCS    A
 1532   REF   1                27,2026  1 2034 0           TCF    TOBALLC        YES
 1533   REF  10  LAST  381     27,2027  0 6006 1           TC     INTPRET
 1534                          27,2030   77624 1           CALL
 1535   REF   2  LAST  381     27,2031   56126 1                  VECPOINT       TO COMPUTE FINAL ANGLES
 1536   REF   3  LAST  381     27,2032   01156 1           STORE  CPHI           STORE ANGLES
 1537                          27,2033   77776 1           EXIT

 1538   REF   8  LAST  247     27,2034  3 4371 0  TOBALLC  CAF    PRIO30         IS MODE AUTO AND CTL GNC
```

```
1539                                27,2035  0 0006 1           EXTEND
1540    REF    1                    27,2036  06 031 C           RXOR    CHAN31
1541    REF    2  LAST  161         27,2037  7 7707 1           MASK    13,14,15
1542                                27,2040  0 0006 1           EXTEND
1543                                27,2041  1 2043 C           BZF     +2          AUTO, NON-FLASH N18
1543C1  REF    2  LAST  381         27,2042  1 2013 C           TCF     TOBALL      NOT AUTO

1548    REF    2  LAST  381         27,2043  3 2125 C           CAF     V06N18      SET UP NON-FLASHING V06 N18
1549    REF   55  LAST  381         27,2044  0 4555 C           TC      BANKCALL
1550    REF    1                    27,2045   20602 1           CADR    GODSPR
1551    REF    2  LAST  381         27,2046  0 2056 C           TC      CHKLINUS

1552    REF   56  LAST  382         27,2047  0 4555 C  STARTMNV  TC      BANKCALL
1553    REF    1                    27,2050   17547 1           CADR    GOMANUR
1555    REF    3  LAST  382         27,2051  1 2013 C  ENDMANUV  TCF     TOBALL      FINISHED MANEUVER

1566    REF   18  LAST  26C         27,2052  0 5447 C  ENDMANU1  TC      DOWNFLAG    RESET 3-AXIS FLAG
1567    REF    1                    27,2053   00124 C           ADRES   3AXISFLG     BIT 6 FLAG 5
1568    REF    3  LAST  381         27,2054  31'146 C           CAE     TEMPR60                                  -
1569    REF    5  LAST  355         27,2055  0 4577 C           TC      BANKJUMP                                 -

1570    REF    3  LAST  230         27,2056  4 0100 1  CHKLINUS  CS      FLAGWRD4
1571    REF   19  LAST  363         27,2057  7 4677 1           MASK    BIT12       IS PRIORITY DISPLAY FLAG SET -
1572    REF  126  LAST  381         27,2060  1C 000 C           CCS     A                                        -
1572C1  REF  136  LAST  375         27,2061  0 0002 C           TC      Q           NO - EXIT
1572C2  REF  137  LAST  382         27,2062  3 0002 C           CA      Q
1572C4  REF  215  LAST  372         27,2063  54 156 1           TS      MPAC +2     SAVE RETURN
15721   REF   13  LAST  352         27,2064  4 6214 1           CS      THREE       OBTAIN LOCATION FOR RESTART.
157212  REF    2  LAST   6E         27,2065  6 0133 C           AD      BUF2        HOLDS Q OF LAST DISPALY
1573    REF    2  LAST  214         27,2066  55'053 1           TS      TBASE1

1580    REF    5  LAST  259         27,2067  0 5301 C           TC      PHASCHNG
1581                                27,2070   00071 1           OCT     71          1.7SPOT FOR RELINUS

1586    REF   3C  LAST  371         27,2071  3 4704 C           CAF     BIT7
1587    REF    1                    27,2072  0 5415 1           TC      LINUS       GO SET BITS FOR PRIORITY DISPLAY -
1588    REF  216  LAST  382         27,2073  0 0156 C           TC      MPAC +2

15881   REF   19  LAST  375         27,2074  3 4706 1  RELINUS   CAF     BIT5        IS TRACK FLAG ON
158812  REF   1C  LAST  252         27,2075  7 0075 1           MASK    FLAGWRD1
158813                              27,2076  0 0006 1           EXTEND
158814  REF    1                    27,2077  1 2111 C           BZF     GOREDO20    NO

158815  REF   13  LAST  260         27,2100  0 5435 C           TC      UPFLAG
158816  REF    1                    27,2101   00077 1           ADRES   PDSPFLAG    R60 PRIODSP FLAG

15882   REF   14  LAST  382         27,2102  0 5435 C           TC      UPFLAG
158821  REF    1                    27,2103   00024 1           ADRES   TARG1FLG    FOR R52

158822  REF   83  LAST  380         27,2104  3 4714 1           CAF     ZERO        RESET TO ZERO, SINCE
```

L R6C,R62 USER'S PAGE NO. 3 E2 S4

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158823 REF  21 LAST 252  27,2105  55'303 1          TS      OPTIND    OPTIND WAS SET TO -1 BY V379

15883  REF   1           27,2106  3 4761 C          CAF     PRIO14    RESTORE ORIGINAL PRIORITY
15884  REF   5 LAST 248  27,2107  0 5103 C          TC      PRIOCHNG

15885  REF   3 LAST 382  27,2110  0 1053 C          TC      TBASE1

15886  REF   6 LAST 382  27,2111  0 5301 C GOREDO20 TC      PHASCHNG
15887                     27,2112   00111 C          OCT     111       1.11 FOR PIKUP20

15888  REF  48 LAST 381  27,2113  0 5112 C          TC      ENDOFJOB

1589   REF   7 LAST 368  27,2114  3 1011 C R61TEST  CA      MODREG    ARE WE IN P00.  IF YES THIS MUST BE
15891                     27,2115  0 0006 1          EXTEND              VERB49 OR VERB89 SO DO ENDEXT.
15892  REF   2 LAST 381  27,2116  1 2052 C          BZF     ENDMANU1  RESET 3-AXIS & RUTURN.  USER DOES ENDEXT
15893  REF   4 LAST 382  27,2117  3 0100 C          CA      FLAGWRD4  ARE WE IN R61 (P20)
1590   REF  20 LAST 382  27,2120  7 4677 1          MASK    BIT12
1591                     27,2121  0 0006 1          EXTEND
1592   REF   2 LAST 184  27,2122  1 4106 C          BZF     GOTOPOOH  NO
1593   REF   1           27,2123  0 4550 C          TC      GOTOV56   YES

1594                     27,2124    20100 1 BIT14+7 OCT     20100
1595                     27,2125    01422 1 V06N18  VN      0618
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L R6C,R62 USER'S PAGE NO. 4 E2 S4

P1597 PROGRAM DESCRIPTION - VECPOINT

R1598 THIS INTERPRETIVE SUBROUTINE MAY BE USED TO POINT A SPACECRAFT AXIS IN A DESIRED DIRECTION. THE AXIS
R1600 TO BE POINTED MUST APPEAR AS A HALF UNIT DOUBLE PRECISION VECTOR IN SUCCESSIVE LOCATIONS OF ERASABLE MEMORY
R1602 BEGINNING WITH THE LOCATION CALLED SCAXIS. THE COMPONENTS OF THIS VECTOR ARE GIVEN IN SPACECRAFT COORDINATES.
R1604 THE DIRECTION IN WHICH THIS AXIS IS TO BE POINTED MUST APPEAR AS A HALF UNIT DOUBLE PRECISION VECTOR IN
R1606 SUCCESSIVE LOCATIONS OF ERASABLE MEMORY BEGINNING WITH THE ADDRESS CALLED PCINTVSM. THE COMPONENTS OF THIS
R1608 VECTOR ARE GIVEN IN STABLE MEMBER COORDINATES. WITH THIS INFORMATION VECPOINT COMPUTES A SET OF THREE GIMBAL
R1610 ANGLES (2S COMPLEMENT) CORRESPONDING TO THE CROSS-PRODUCT ROTATION BETWEEN SCAXIS AND PCINTVSM AND STORES THEM
R1612 IN T(MPAC) BEFORE RETURNING TO THE CALLER.
R1613 THIS ROTATION, HOWEVER, MAY BRING THE S/C INTO GIMBAL LOCK. WHEN POINTING A VECTOR IN THE Y-Z PLANE,
R1615 THE TRANSPONDER AXIS, OR THE AOT FOR THE LEM, THE PROGRAM WILL CORRECT THIS PROBLEM BY ROTATING THE CROSS-
R1617 PRODUCT ATTITUDE ABOUT POINTVSM BY A FIXED AMOUNT SUFFICIENT TO ROTATE THE DESIRED S/C ATTITUDE OUT OF GIMBAL
R1619 LOCK. IF THE AXIS TO BE POINTED IS MORE THAN 40.6 DEGREES BUT LESS THAN 60.5 DEG FROM THE +X (OR-X) AXIS,
R1621 THE ADDITIONAL ROTATION TO AVOID GIMAL LOCK IS 35 DEGREES. IF THE AXIS IS MORE THAN 60.5 DEGEES FROM +X (OR -X)
R1623 THE ADDITIONAL ROTATION IS 35 DEGREES. THE GIMBAL ANGLES CORRESPONDING TO THIS ATTITUDE ARE THEN COMPUTED AND
R1625 STORED AS 2S COMPLIMENT ANGLES IN T(MPAC) BEFORE RETURNING TO THE CALLER.
R1627 WHEN POINTING THE X-AXIS, OR THE THRUST VECTOR, OR ANY VECTOR WITHIN 40.6 DEG OF THE X-AXIS, VECPOINT
R1629 CANNOT CORRECT FOR A CROSS-PRODUCT ROTATION INTO GIMBAL LOCK. IN THIS CASE A PLATFORM REALIGNMENT WOULD BE
R1631 REQUIRED TO POINT THE VECTOR IN THE DESIRED DIRECTION. AT PRESENT NO INDICATION IS GIVEN FOR THIS SITUATION
R1633 EXCEPT THAT THE FINAL MIDDLE GIMBAL ANGLE IN MPAC +2 IS GREATER THAN 59 DEGREES.

R1635 CALLING SEQUENCE -
R1636 1) LOAD SCAXIS, PCINTVSM
R1637 2) CALL
R1638 VECPOINT

R1639 RETURNS WITH

R1640 1) DESIRED OUTER GIMBAL ANGLE IN MPAC
R1641 2) DESIRED INNER GIMBAL ANGLE IN MPAC +1
R1642 3) DESIRED MIDDLE GIMBAL ANGLE IN MPAC +2

R1643 ERASABLES USED -

R1644	1) SCAXIS	6
R1645	2) PCINTVSM	6
R1646	3) MIS	18
R1647	4) DEL	18
R1648	5) CDF	6
R1649	6) VECQTEMP	1
R1650	7) ALL OF VAC AREA	43
R1651	TOTAL	99

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 1652  REF  1          27,2000          SETLOC VECPT
 1653                  27,2126          BANK
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1654   REF  4  LAST  111   E6,1661                          EBANK= BCDU

1655   REF  1                                              COUNT  27/VECPT

1656                       27,2126   40020 1  VECPOINT STQ    BOV          SAVE RETURN ADDRESS
1657   REF  1              27,2127   03310 0                  VECQTEMP
1658   REF  1              27,2130   56131 1                  VECLEAR      AND CLEAR OVFIND
1659                       27,2131   47164 1  VECLEAR  AXC,2  RTB
1660   REF  2  LAST  111   27,2132   03320 0                  MIS          READ THE PRESENT CDU ANGLES AND
1661   REF  1              27,2133   44376 0                  READCDUK     STORE THEM IN PD25, 26, 27
1662                       27,2134   34032 1          STCALL  25D
1663   REF  1              27,2135   44405 0                  CDUTCDCM     S/C AXES TO STABLE MEMBER AXES (MIS)
1664                       27,2136   61375 1          VLOAD   VXM
1665   REF  2  LAST  111   27,2137   03357 0                  POINTVSM     RESOLVE THE POINTING DIRECTION VF INTO
1666   REF  3  LAST  385   27,2140   03321 1                  MIS          INITIAL S/C AXES ( VF = POINTVSM)
1667                       27,2141   77656 1          UNIT
1668                       27,2142   00035 1          STORE   28D
A1669                                                                     PD 28 29 30 31 32 33
1670                       27,2143   53435 0          VXV     UNIT         TAKE THE CROSS PRODUCT VF X VI
1671   REF  2  LAST  111   27,2144   03351 0                  SCAXIS       WHERE VI = SCAXIS
1672                       27,2145   57400 1          BOV     VCOMP
1673   REF  1              27,2146   56256 0                  PICKAXIS
1674   REF  2  LAST  111   27,2147   17343 0          STODL   COF          CHECK MAGNITUDE
1675                       27,2150   00045 0                  36D          OF CROSS PRODUCT
1676                       27,2151   50025 0          DSU     BMN          VECTOR, IF LESS
1677   REF  1              27,2152   16327 0                  DPB-14       THAN B-14 ASSUME
1678   REF  2  LAST  385   27,2153   56256 0                  PICKAXIS     UNIT OPERATION
1679                       27,2154   50375 0          VLOAD   DOT                   INVALID.
1680   REF  3  LAST  385   27,2155   03351 0                  SCAXIS
1681                       27,2156   00035 1                  28D
1682                       27,2157   65552 0          SL1     ARCCOS
1683                       27,2160   77624 1  COMPMATX CALL                 NOW COMPUTE THE TRANSFORMATION FROM
1684   REF  1              27,2161   44530 1                  DELCOMP      FINAL S/C AXES TO INITIAL S/C AXES  MFI
1685                       27,2162   75160 1          AXC,1   AXC,2
1686   REF  4  LAST  385   27,2163   03320 0                  MIS          COMPUTE THE TRANSFORMATION FROM FINAL
1687   REF  1              27,2164   03425 1                  DEL          S/C AXES TO STABLE MEMBER AXES
1688                       27,2165   77624 1          CALL                  MFS = MIS MFI
1689   REF  1              27,2166   44304 0                  MXM3         (IN PD LIST)

1690                       27,2167   51545 1          DLOAD   ABS
1691                       27,2170   00007 0                  6            MFS6 = SIN(CPSI)                    $2
1692                       27,2171   50025 0          DSU     BMN
1693   REF  1              27,2172   16314 0                  SINGIMLC     = SIN(59 DEGS)                      $2
1694   REF  1              27,2173   56246 1                  FINDGIMB     /CPSI/ LESS THAN 59 DEGS
A1695                                                                     I.E. DESIRED ATTITUDE NOT IN GIMBAL LOCK

1696                       27,2174   51545 1          DLOAD   ABS          CHECK TO SEE IF WE ARE POINTING
1697   REF  4  LAST  385   27,2175   03351 0                  SCAXIS       THE THRUST AXIS
1698                       27,2176   51025 1          DSU     BPL
1699   REF  1              27,2177   16316 1                  SINVEC1      SIN 49.4 DEGS                       $2
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 1700  REF  2  LAST  385   27,2200  56246 1                  FINDGIMB  IF SO, WE ARE TRYING TO POINT IT INTO
 1701                      27,2201  77775 1          VLOAD             GIMBAL LOCK, ABORT COULD GO HERE
 1702                      27,2202  77626 0          STADR
 1703  REF  5  LAST  385   27,2203  50442 0          STOVL    MIS +12D
 1704                      27,2204  77626 0          STADR             STORE MFS (IN PD LIST) IN MIS
 1705  REF  6  LAST  386   27,2205  50450 0          STOVL    MIS +6
 1706                      27,2206  77626 0          STADR
 1707  REF  7  LAST  386   27,2207  50456 0          STOVL    MIS
 1708  REF  8  LAST  386   27,2210  03327 1                   MIS +6   INNER GIMBAL AXIS IN FINAL S/C AXES
 1709                      27,2211  57444 1          BPL      VCOMP    LOCATE THE IG AXIS DIRECTION CLOSEST TO
 1710  REF  1              27,2212  56213 1                   IGSAMEX  FINAL X S/C AXIS

 1711                      27,2213  50035 1 IGSAMEX  VXV      BMN      FIND THE SHORTEST WAY OF ROTATING THE
 1712  REF  5  LAST  385   27,2214  03351 0                   SCAXIS   S/C OUT OF GIMBAL LOCK BY A ROTATION
 1713  REF  1              27,2215  56222 0                   U=SCAXIS ABOUT +- SCAXIS, I.E. IF (IG (SGN MFS3)
A1714                                                                  X SCAXIS . XF) LESS THAN 0, U = SCAXIS
A1715                                                                  OTHERWISE U = -SCAXIS

 1716                      27,2216  57575 1          VLOAD    VCOMP
 1717  REF  6  LAST  386   27,2217  03351 0                   SCAXIS
 1718  REF  3  LAST  385   27,2220  37343 1          STCALL   COF      ROTATE ABOUT -SCAXIS
 1719  REF  1              27,2221  56225 1                   CHEKAXIS
 1720                      27,2222  77775 1 U=SCAXIS VLOAD
 1721  REF  7  LAST  386   27,2223  03351 0                   SCAXIS
 1722  REF  4  LAST  386   27,2224  03343 0          STORE    COF      ROTATE ABOUT + SCAXIS
 1723                      27,2225  51545 1 CHEKAXIS DLOAD    ABS
 1724  REF  8  LAST  386   27,2226  03351 0                   SCAXIS   SEE IF WE ARE POINTING THE AOT
 1725                      27,2227  51025 1          DSU      BPL
 1726  REF  1              27,2230  16320 1                   SINVEC2  SIN 29.5 DEGS                          $2
 1727  REF  1              27,2231  56235 0                   PICKANG1 IF SO, ROTATE 50 DEGS ABOUT +- SCAXIS
 1728                      27,2232  52145 0          DLOAD    GOTO     IF NOT, MUST BE POINTING THE TRANSPONDER
 1729  REF  1              27,2233  16324 0                   VECANG2  OR SOME VECTOR IN THE Y, OR Z PLANE
 1730  REF  1              27,2234  56237 1                   COMPMFSN IN THIS CASE ROTATE 35 DEGS TO GET OUT
A1731                                                                  OF GIMBAL LOCK (VECANG2  $360)
 1732                      27,2235  77745 1 PICKANG1 DLOAD
 1733  REF  1              27,2236  16322 0                   VECANG1  = 50 DEGS                              $ 360
 1734                      27,2237  77624 1 COMPMFSN CALL
 1735  REF  2  LAST  385   27,2240  44530 1                   DELCOMP  COMPUTE THE ROTATION ABOUT SCAXIS TO
 1736                      27,2241  75160 1          AXC,1    AXC,2    BRING MFS OUT OF GIMBAL LOCK
 1737  REF  9  LAST  386   27,2242  03320 0                   MIS
 1738  REF  2  LAST  385   27,2243  03425 1                   DEL
 1739                      27,2244  77624 1          CALL
 1740  REF  2  LAST  385   27,2245  44304 0                   MXM3     DESIRED S/C AXES TO STABLE MEMBER AXES
A1741                                                                  WHICH WILL ALIGN VI WITH VF AND AVOID
A1742                                                                  GIMBAL LOCK
 1743                      27,2246  45160 1 FINDGIMB AXC,1    CALL
 1744                      27,2247  00000 1                   0        EXTRACT THE COMMANDED CDU ANGLES FROM
 1745  REF  1              27,2250  44655 1                   DCMTOCDU THIS MATRIX
 1746                      27,2251  40234 0          RTB      SETPD
 1747  REF  1              27,2252  45547 0                   VISTO2S  CONVERT TO 2:S COMPLEMENT
```

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1748                          27,2253  00001 0                  0
1749                          27,2254  77650 1          GOTO
1750  REF   2  LAST  385     27,2255  03310 0                  VECQTEMP       RETURN TO CALLER

1751                          27,2256  50375 0  PICKAXIS VLOAD  DOT            IF VF X VI = 0,  FIND VF . VI
1752                          27,2257  00035 1                  28D
1753  REF   9  LAST  386     27,2260  03351 0                  SCAXIS
1754                          27,2261  72240 1          BMN     TLOAD
1755  REF   1                27,2262  56266 0                  ROT180
1756                          27,2263  00032 0                  25D
1757                          27,2264  77650 1          GOTO                   IF VF = VI, CDU DESIRED = PRESENT CDU
1758  REF   3  LAST  387     27,2265  03310 0                  VECQTEMP       PRESENT CDU ANGLES

1759                          27,2266  47375 0  ROT180   VLOAD   VXV            IF VF, VI ANTIPARALLEL, 180 DEG ROTATION
1760  REF  10  LAST  386     27,2267  03327 1                  MIS +6         IS REQUIRED. Y STABLE MEMBER AXIS IN
1761  REF   2  LAST  279     27,2270  15330 0                  HIUNITX        INITIAL S/C AXIS.
1762                          27,2271  47256 0          UNIT    VXV            FIND Y(SM) X X(I)
1763  REF  10  LAST  387     27,2272  03351 0                  SCAXIS         FIND UNIT(VI X UNIT(Y(SM) X X(I)))
1764                          27,2273  40056 0          UNIT    BOV            I.E. PICK A VECTOR IN THE PLANE OF X(I),
1765  REF   1                27,2274  56310 0                  PICKX          Y(SM) PERPENDICULAR TO VI
1766  REF   5  LAST  386     27,2275  17343 0          STODL   COF
1767                          27,2276  00045 0                  36D            CHECK MAGNITUDE
1768                          27,2277  50025 0          DSU     BMN            OF THIS VECTOR.
1769  REF   2  LAST  385     27,2300  16327 0                  DPB-14         IF LESS THAN B-14,
1770  REF   2  LAST  387     27,2301  56310 0                  PICKX          PICK X-AXIS.
1771                          27,2302  77775 1          VLOAD
1772  REF   6  LAST  387     27,2303  03343 0                  COF
1773  REF   7  LAST  387     27,2304  17343 0  XROT    STODL   COF
1774  REF   2  LAST  287     27,2305  15330 0                  HIDPHALF
1775                          27,2306  77650 1          GOTO
1776  REF   1                27,2307  56160 0                  COMPMATX
1777                          27,2310  52175 0  PICKX   VLOAD   GOTO           PICK THE XAXIS IN THIS CASE
1778  REF   3  LAST  387     27,2311  15330 0                  HIUNITX
1779  REF   1                27,2312  56304 0                  XROT
1780                          35,2000          BANK    35
1781  REF   1                27,2000          SETLOC  MANUVER1
1782                          27,2313          BANK

1783                          27,2313  15555 0  SINGIMLC 2DEC   .4285836003    =SIN(59)                $2
1783                          27,2314  35172 0
1784                          27,2315  14113 1  SINVEC1  2DEC   .3796356537    =SIN(49.4)              $2
1784                          27,2316  36326 0
1785                          27,2317  07701 0  SINVEC2  2DEC   .2462117800    =SIN(29.5)              $2
1785                          27,2320  35703 0
1786                          27,2321  04343 1  VECANG1  2DEC   .1388888889    = 50 DEGREES                    $360
1786                          27,2322  21616 0
1787                          27,2323  03070 0  VECANG2  2DEC   .09722222222   = 35 DEGREES                    $360
1787                          27,2324  34344 0
1788                          27,2325  00000 1  1BITDP   OCT     0              KEEP THIS BEFORE DPB(-14)       *********
1789                          27,2326  00001 0  DPB-14   OCT     00001
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1790                          27,2327   00000 1          OCT    00000
1791                          34,2002                    BANK   34
1792  REF   2  LAST  381       27,2000                  SETLOC MANUVER
1793                          27,2330                    BANK
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P1794 ROUTINE FOR INITIATING AUTOMATIC MANEUVER VIA KEYBOARD (V49)

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 1795   REF   4  LAST  381      1155                        EBANK= CPHI

 1796   REF   1                                            COUNT  27/R62

 1797   REF   1                27,2330  3 4745 C  R62DISP  CAF    V06N22        DISPLAY COMMAND ICDUS CPHI, CTHETA, CPHI
 1798   REF  57  LAST  382     27,2331  0 4555 C           TC     BANKCALL
 1799   REF   2  LAST  189     27,2332    20624 C          CADR   GOFLASH
 1800   REF  16  LAST  256     27,2333  1 5423 C           TCF    ENDEXT
 1801   REF   1                27,2334  1 2336 1           TCF    GOMOVE        PROCEED
 1802   REF   2  LAST  245     27,2335  1 2330 1           TCF    R62DISP       ENTER

A1803                                                                          ASTRONAUT MAY LOAD NEW ICDUS AT THIS
A1804                                                                          POINT
 1805   REF  15  LAST  382     27,2336  0 5435 C  GOMOVE   TC     UPFLAG        SET 3-AXIS FLAG
 1806   REF   2  LAST  382     27,2337    00124 C          ADRES  3AXISFLG      BIT 6  FLAG 5
 1807   REF  58  LAST  389     27,2340  0 4555 C           TC     BANKCALL
 1808   REF   1                27,2341    56000 1          CADR   R60CSM

 1809   REF  17  LAST  389     27,2342  1 5423 C           TCF    ENDEXT
```

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0500                          15,2000                    BANK    15
0500C1 REF    1               22,2000                    SETLOC  KALCMCN1
0500C2                        22,2000                    BANK

0501   REF    5  LAST  385    E6,1661                    EBANK=  BCDU

05015  REF    1                                         COUNT   22/KALC

0502   REF   11  LAST  381    22,2000   0 6006 1  KALCMAN3 TC       INTPRET
0503                          22,2001    77634 0          RTB
0504   REF    2  LAST  385    22,2002    44376 0                   READCDUK        PICK UP CURRENT CDU ANGLES
0505   REF    6  LAST  39C    22,2003    03262 1          STORE    BCDU            STORE THE INITIAL S/C ANGLES
0516                          22,2004    72364 0          AXC,2    TLOAD           COMPUTE THE TRANSFORMATION FROM
0517   REF   11  LAST  387    22,2005    03320 0                   MIS             INITIAL S/C AXES TO STABLE MEMBER AXES
0518   REF    7  LAST  39C    22,2006    03262 1                   BCDU            (MIS)
0519                          22,2007    77624 1          CALL
0520   REF    2  LAST  385    22,2010    44405 0                   CDUTCDCM
0521                          22,2011    72364 0          AXC,2    TLOAD           COMPUTE THE TRANSFORMATION FROM
0522   REF    4  LAST  118    22,2012    03425 1                   MFS             FINAL S/C AXES TO STABLE MEMBER AXES
0523   REF    5  LAST  389    22,2013    01156 1                   CPHI            (MFS)
0524                          22,2014    77624 1          CALL
0525   REF    3  LAST  39C    22,2015    44405 0                   CDUTCDCM
0526                          22,2016    45160 1  SECAD   AXC,1    CALL            MIS AND MFS ARRAYS CALCULATED        #2
0527   REF   12  LAST  39C    22,2017    03320 0                   MIS
0528   REF    1               22,2020    44334 0                   TRANSPOS
0529                          22,2021    77775 1          VLOAD
0530                          22,2022    77626 0          STADR
0531   REF   12  LAST  111    22,2023    50474 0          STOVL    TMIS +12D
0532                          22,2024    77626 0          STADR
0533   REF   13  LAST  39C    22,2025    50502 0          STOVL    TMIS +6
0534                          22,2026    77626 0          STADR
0535   REF   14  LAST  39C    22,2027    74510 0          STORE    TMIS            TMIS = TRANSPOSE(MIS) SCALED BY 2
0536                          22,2030    75160 1          AXC,1    AXC,2
0537   REF   15  LAST  39C    22,2031    03266 0                   TMIS
0538   REF    5  LAST  39C    22,2032    03425 1                   MFS
0539                          22,2033    77624 1          CALL
0540   REF    3  LAST  386    22,2034    44304 0                   MXM3
0541                          22,2035    45575 1          VLOAD    STADR
0542   REF    1               22,2036    50335 1          STOVL    MFI +12D
0543                          22,2037    77626 0          STADR
0544   REF    2  LAST  39C    22,2040    50343 0          STOVL    MFI +6
0545                          22,2041    77626 0          STADR
0546   REF    3  LAST  39C    22,2042    74351 0          STORE    MFI             MFI = TMIS MFS (SCALED BY 4)
0547                          22,2043    45001 1          SETPD    CALL            TRANSPOSE MFI IN PD LIST
0548                          22,2044    00023 0                   18D
0549   REF    1               22,2045    44343 0                   TRNSPSPD
0550                          22,2046    45575 1          VLOAD    STADR
0551   REF    1               22,2047    50474 0          STOVL    TMFI +12D
0552                          22,2050    77626 0          STADR
0553   REF    2  LAST  39C    22,2051    50502 0          STOVL    TMFI +6
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 0554                          22,2052   77626 C          STADR
 0555  REF   3  LAST  390     22,2053   74510 C          STORE  TMFI          TMFI = TRANSPOSE (MFI)  SCALED BY 4
R0556
R0557  CALCULATE COFSKEW AND MFISYN
R0558
 0559                          22,2054   45345 1          DLOAD  DSU
 0560  REF   4  LAST  391     22,2055   03271 C                 TMFI +2
 0561  REF   4  LAST  390     22,2056   03430 C                 MFI +2
 0562                          22,2057   45325 1          PDDL   DSU           CALCULATE COF SCALED BY 2/SIN(AM)
 0563  REF   5  LAST  391     22,2060   03432 1                 MFI +4
 0564  REF   5  LAST  391     22,2061   03273 1                 TMFI +4
 0565                          22,2062   45325 1          PDDL   DSU
 0566  REF   6  LAST  391     22,2063   03301 C                 TMFI +10D
 0567  REF   6  LAST  391     22,2064   03440 1                 MFI +10D
 0568                          22,2065   77666 1          VDEF
 0569  REF   4  LAST  111     22,2066   03311 1          STORE  COFSKEW       EQUALS MFISKEW
R0570
R0571  CALCULATE AM AND PROCEED ACCORDING TO ITS MAGNITUDE
R0572
 0573                          22,2067   43345 1          DLOAD  DAD
 0574  REF   7  LAST  391     22,2070   03426 1                 MFI
 0575  REF   8  LAST  391     22,2071   03446 1                 MFI +16D
 0576                          22,2072   43225 C          DSU    DAD
 0577  REF   2  LAST   31     22,2073   15322 C                 DP1/4TH
 0578  REF   9  LAST  391     22,2074   03436 C                 MFI +8D
 0579  REF   3  LAST  111     22,2075   03317 1          STORE  CAM           CAM = (MFI0+MFI4+MFI8-1)/2 HALF SCALE
 0580                          22,2076   77726 1          ARCCOS
 0581  REF   2  LAST  111     22,2077   03365 1          STORE  AM            AM=ARCCOS(CAM)  (AM SCALED BY 2)
 0582                          22,2100   51025 1          DSU    BPL
 0583  REF   1                 22,2101   04367 1                 MINANG
 0584  REF   1                 22,2102   44111 C                 CHECKMAX
 0585                          22,2103   77776 1          EXIT                 MANEUVER LESS THAN 0.25 DEG
 0586                          22,2104   0 0004 C         INHINT               GO DIRECTLY INTO ATTITUDE HOLD
 0587  REF  51  LAST  379     22,2105   4 4712 C         CS     ONE           ABOUT COMMANDED ANGLES
 0588  REF   1                 22,2106   55'332 C         TS     HOLDFLAG      NOGO WILL STOP ANY RATE AND SET UP FOR A
 0589  REF   1                 22,2107   0 3301 C         TC     LOADCDUD      GOOD RETURN
 0590  REF   1                 22,2110   1 2727 C         TCF    NOGO

 0597                          22,2111   45345 1  CHECKMAX DLOAD  DSU
 0598  REF   3  LAST  391     22,2112   03365 1                 AM
 0599  REF   1                 22,2113   04370 1                 MAXANG
 0600                          22,2114   77244 C          BPL    VLOAD
 0601  REF   1                 22,2115   44123 1                 ALTCALC       UNIT
 0602  REF   5  LAST  391     22,2116   03311 1                 COFSKEW       COFSKEW
 0603                          22,2117   77656 1          UNIT
 0604  REF   8  LAST  387     22,2120   03343 C          STORE  COF           COF IS THE MANEUVER AXIS
 0605                          22,2121   77650 1          GOTO                 SEE IF MANEUVER GOES THRU GIMBAL LOCK
 0606  REF   1                 22,2122   44736 C                 LOCSKIRT
 0607                          22,2123   53375 0  ALTCALC VLOAD  VAD           IF AM GREATER THAN 170 DEGREES
 0608  REF  10  LAST  391     22,2124   03426 1                 MFI
```

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0609    REF   7  LAST  391    22,2125   03267 1                TMFI
0610                          22,2126   77762 1          VSR1
0611    REF   1                22,2127   27267 1          STOVL  MFISYM
0612    REF   11 LAST  391     22,2130   03434 1                 MFI +6
0613                          22,2131   74455 0          VAD    VSR1
0614    REF   8  LAST  392     22,2132   03275 1                TMFI +6
0615    REF   2  LAST  392     22,2133   27275 1          STOVL  MFISYM +6
0616    REF   12 LAST  392     22,2134   03442 0                 MFI +12D
0617                          22,2135   74455 0          VAD    VSR1
0618    REF   9  LAST  392     22,2136   03303 1                TMFI +12D
0619    REF   3  LAST  392     22,2137   03303 1          STORE  MFISYM +12D     MFISYM=(MFI+TMFI)/2  SCALED BY 4
R0620
R0621
R0622   CALCULATE COF
R0623
0624                          22,2140   70545 1          DLOAD  SR1
0625    REF   4  LAST  391     22,2141   03317 1                CAM
0626                          22,2142   45325 1          PDDL   DSU             PDO CAM                          $4
0627    REF   1                22,2143   15330 0                DPHALF
0628    REF   5  LAST  392     22,2144   03317 1                CAM
0629                          22,2145   65204 1          BOVB   PDDL            PD2 1 - CAM                      $2
0630    REF   1                22,2146   45707 0                SIGNMPAC
0631    REF   4  LAST  392     22,2147   03307 0                MFISYM +16D
0632                          22,2150   56225 1          DSU    DDV
0633                          22,2151   00001 0                0
0634                          22,2152   00003 1                2
0635                          22,2153   65366 1          SQRT   PDDL            COFZ = SQRT(MFISYM8-CAM)/1-CAM)
0636    REF   5  LAST  392     22,2154   03277 0                MFISYM +8D                              $ ROOT 2
0637                          22,2155   56225 1          DSU    DDV
0638                          22,2156   00001 0                0
0639                          22,2157   00003 1                2
0640                          22,2160   65366 1          SQRT   PDDL            COFY = SQRT(MFISYM4-CAM)/(1-CAM)  $ROOT2
0641    REF   6  LAST  392     22,2161   03267 1                MFISYM
0642                          22,2162   56225 1          DSU    DDV
0643                          22,2163   00001 0                0
0644                          22,2164   00003 1                2
0645                          22,2165   55566 1          SQRT   VDEF            COFX = SQRT(MFISYM-CAM)/(1-CAM)  $ROOT 2
0646                          22,2166   77656 1          UNIT
0647    REF   9  LAST  391     22,2167   03343 0          STORE  COF
R0648
R0649   DETERMINE  LARGEST COF AND ADJUST ACCORDINGLY
R0650
0651                          22,2170   45345 1  COFMAXGO DLOAD  DSU
0652    REF   10 LAST  392     22,2171   03343 0                COF
0653    REF   11 LAST  392     22,2172   03345 0                COF +2
0654                          22,2173   71240 1          BMN    DLOAD           COFY G COFX
0655    REF   1                22,2174   44203 0                COMP12
0656    REF   12 LAST  392     22,2175   03343 0                COF
0657                          22,2176   50025 0          DSU    BMN
0658    REF   13 LAST  392     22,2177   03347 1                COF +4
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0659   REF   1                 22,2200  44260 C                  METHOD3    COFZ G COFX OR COFY
0660                           22,2201  77650 1          GOTO
0661   REF   1                 22,2202  44234 1                  METHOD1    COFX G COFY OR COFZ
0662                           22,2203  45345 1  COMP12  DLOAD   DSU
0663   REF  14  LAST  392      22,2204  03345 C                  COF +2
0664   REF  15  LAST  393      22,2205  03347 1                  COF +4
0665                           22,2206  77640 C          BMN
0666   REF   2  LAST  393      22,2207  44260 C                  METHOD3    COFZ G COFY OR COFX

0667                           22,2210  51145 C  METHOD2 DLOAD   BPL        COFY MAX
0668   REF   6  LAST  391      22,2211  03313 C                  COFSKEW +2 UY
0669   REF   1                 22,2212  44216 1                  U2POS
0670                           22,2213  57575 1          VLOAD   VCOMP
0671   REF  16  LAST  393      22,2214  03343 C                  COF
0672   REF  17  LAST  393      22,2215  03343 C          STORE   COF
0673                           22,2216  51145 C  U2POS  DLOAD   BPL
0674   REF   7  LAST  392      22,2217  03271 C                  MFISYM +2  UX UY
0675   REF   1                 22,2220  44224 C                  OKU21
0676                           22,2221  57545 1          DLOAD   DCOMP      SIGN OF UX OPPOSITE TO UY
0677   REF  18  LAST  393      22,2222  03343 C                  COF
0678   REF  19  LAST  393      22,2223  03343 C          STORE   COF
0679                           22,2224  51145 C  OKU21  DLOAD   BPL
0680   REF   8  LAST  393      22,2225  03301 C                  MFISYM +10D UY UZ
0681   REF   2  LAST  391      22,2226  44736 C                  LOCSKIRT
0682                           22,2227  57545 1          DLOAD   DCOMP      SIGN OF UZ OPPOSITE TO UY
0683   REF  20  LAST  393      22,2230  03347 1                  COF +4
0684   REF  21  LAST  393      22,2231  03347 1          STORE   COF +4
0685                           22,2232  77650 1          GOTO
0686   REF   3  LAST  393      22,2233  44736 C                  LOCSKIRT
0687                           22,2234  51145 C  METHOD1 DLOAD   BPL        COFX MAX
0688   REF   7  LAST  393      22,2235  03311 1                  COFSKEW    UX
0689   REF   1                 22,2236  44242 C                  U1POS
0690                           22,2237  57575 1          VLOAD   VCOMP
0691   REF  22  LAST  393      22,2240  03343 C                  COF
0692   REF  23  LAST  393      22,2241  03343 C          STORE   COF
0693                           22,2242  51145 C  U1POS  DLOAD   BPL
0694   REF   9  LAST  393      22,2243  03271 C                  MFISYM +2  UX UY
0695   REF   1                 22,2244  44250 C                  OKU12
0696                           22,2245  57545 1          DLOAD   DCOMP
0697   REF  24  LAST  393      22,2246  03345 C                  COF +2     SIGN OF UY OPPOSITE TO UX
0698   REF  25  LAST  393      22,2247  03345 C          STORE   COF +2
0699                           22,2250  51145 C  OKU12  DLOAD   BPL
0700   REF  10  LAST  393      22,2251  03273 1                  MFISYM +4  UX UZ
0701   REF   4  LAST  393      22,2252  44736 C                  LOCSKIRT
0702                           22,2253  57545 1          DLOAD   DCOMP      SIGN OF UZ OPPOSITE TO UY
0703   REF  26  LAST  393      22,2254  03347 1                  COF +4
0704   REF  27  LAST  393      22,2255  03347 1          STORE   COF +4
0705                           22,2256  77650 1          GOTO
0706   REF   5  LAST  393      22,2257  44736 C                  LOCSKIRT
0707                           22,2260  51145 C  METHOD3 DLOAD   BPL        COFZ MAX
```

0708	REF	8	LAST	393	22,2261	03315	C			COFSKEW +4	UZ
0709	REF	1			22,2262	44266	C			U3POS	
0710					22,2263	57575	1		VLOAD	VCOMP	
0711	REF	28	LAST	393	22,2264	03343	C			COF	
0712	REF	29	LAST	394	22,2265	03343	C		STORE	COF	
0713					22,2266	51145	C	L3POS	DLOAD	BPL	
0714	REF	11	LAST	393	22,2267	03273	1			MFISYM +4	UX UZ
0715	REF	1			22,2270	44274	C			OKU31	
0716					22,2271	57545	1		DLOAD	DCOMP	
0717	REF	30	LAST	394	22,2272	03343	C			COF	SIGN OF UX OPPOSITE TO UZ
0718	REF	31	LAST	394	22,2273	03343	C		STORE	COF	
0719					22,2274	51145	C	OKU31	DLOAD	BPL	
0720	REF	12	LAST	394	22,2275	03301	C			MFISYM +10D	UY UZ
0721	REF	6	LAST	393	22,2276	44736	C			LOCSKIRT	
0722					22,2277	57545	1		DLOAD	DCOMP	
0723	REF	32	LAST	394	22,2300	03345	C			COF +2	SIGN OF UY OPPOSITE TO UZ
0724	REF	33	LAST	394	22,2301	03345	C		STORE	COF +2	
0725					22,2302	77650	1		GOTO		
0726	REF	7	LAST	394	22,2303	44736	C			LOCSKIRT	

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R0727
R0728   MATRIX OPERATIONS
R0729
 0730                    22,2304  77601 0  MXM3     SETPD            MXM3 MULTIPLIES 2 3X3 MATRICES
 0731                    22,2305  00001 0                0          AND LEAVES RESULT IN PD LIST
 0732                    22,2306  64743 0           DLOAD* PDDL*     ADDRESS OF 1ST MATRIX IN XR1
 0733                    22,2307  77762 1                  12D,2    ADDRESS OF 2ND MATRIX IN XR2
 0734                    22,2310  77770 1                  6,2
 0735                    22,2311  55523 0           PDDL*  VDEF
 0736                    22,2312  77776 1                  0,2
 0737                    22,2313  64717 1           MXV*   PDDL*     M1XM2(COL 1) IN PD
 0738                    22,2314  00001 0                  0,1
 0739                    22,2315  77760 0                  14D,2
 0740                    22,2316  64723 0           PDDL*  PDDL*
 0741                    22,2317  77766 0                  8D,2
 0742                    22,2320  77774 0                  2,2
 0743                    22,2321  63666 1           VDEF   MXV*      DEFINE VECTOR M2(COL 2)
 0744                    22,2322  00001 0                  0,1
 0745                    22,2323  64723 0           PDDL*  PDDL*     M1XM2(COL 2) IN PD
 0746                    22,2324  77756 0                  16D,2
 0747                    22,2325  77764 1                  10D,2
 0748                    22,2326  55523 0           PDDL*  VDEF      DEFINE VECTOR M2(COL 3)
 0749                    22,2327  77772 0                  4,2
 0750                    22,2330  41517 1           MXV*   PUSH      M1XM2(COL 3) IN PD
 0751                    22,2331  00001 0                  0,1
 0752                    22,2332  77650 1                GOTO
 0753  REF  2  LAST 390  22,2333  44343 0                       TRNSPSPD         REVERSE ROWS AND COLS IN PD AND
R0754                                 RETURN WITH M1XM2 IN PD LIST
R0755
 0756                    22,2334  76601 1  TRANSPOS SETPD   VLOAD*    TRANSPOS TRANSPOSES A 3X3 MATRIX
 0757                    22,2335  00001 0                   0          AND LEAVES RESULT IN PD LIST
 0758                    22,2336  00001 0                   0,1        MATRIX ADDRESS IN XR1
 0759                    22,2337  62713 0           PDVL*   PDVL*
 0760                    22,2340  00007 0                   6,1
 0761                    22,2341  00015 0                   12D,1
 0762                    22,2342  77606 1           PUSH                MATRIX IN PD
 0763                    22,2343  65345 0  TRNSPSPD DLOAD   PDDL       ENTER WITH MATRIX IN PD LIST
 0764                    22,2344  00003 1                   2
 0765                    22,2345  00007 0                   6
 0766                    22,2346  14003 1           STODL   2
 0767                    22,2347  77626 0           STADR
 0768                    22,2350  63770 1           STODL   6
 0769                    22,2351  00005 1                   4
 0770                    22,2352  77725 1           PDDL
 0771                    22,2353  00015 0                   12D
 0772                    22,2354  14005 1           STODL   4
 0773                    22,2355  77626 0           STADR
 0774                    22,2356  63762 1           STODL   12D
 0775                    22,2357  00013 0                   10D
 0776                    22,2360  77725 1           PDDL
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0777                        22,2361   00017 1                    14D
0778                        22,2362   14013 C          STODL     10D
0779                        22,2363   77626 C          STADR
0780                        22,2364   77760 C          STORE     14D
0781                        22,2365   77616 C          RVQ                 RETURN WITH TRANSPOSED MATRIX IN PD LIST
0782                        22,2366   00013 C  MINANG  DEC       .00069375
0783                        22,2367   17071 1  MAXANG  DEC       .472222
R0784          GIMBAL LOCK CONSTANTS

R0785          D = MGA CORRESPONDING TO GIMBAL LOCK = 60 DEGREES
R0786          NGL = BUFFER ANGLE (TO AVOID DIVISIONS BY ZERO) = 2 DEGREES

0787                        22,2370   15667 1  SD      DEC       .433015   = SIN(D)                              $2
0788                        22,2371   33555 1  K3S1    DEC       .86603    = SIN(D)                              $1
0789                        22,2372   67777 1  K4      DEC       -.25      = - COS(D)                            $2
0790                        22,2373   04000 C  K4SQ    DEC       .125      = COS(D)COS(D)                        $2
0791                        22,2374   00217 C  SNGLCD  DEC       .008725   = SIN(NGL)COS(D)                      $2
0792                        22,2375   17773 1  CNGL    DEC       .499695   = COS(NGL)                            $2
0794                        22,2376   0 0004 C READCDUK INHINT              LOAD T(MPAC) WITH THE CURRENT CDU ANGLES
0795   REF    5  LAST  237  22,2377   3 0034 C         CA        CDUZ
0796   REF  217  LAST  382  22,2400   54 156 1         TS        MPAC +2
0797                        22,2401   0 0006 1         EXTEND
0798   REF    6  LAST  264  22,2402   3 0033 1         DCA       CDUX
0799                        22,2403   0 0003 1         RELINT
0800   REF    1             22,2404   1 6445 C         TCF       TLOAD +6
0801                        16,2000                    BANK      16
080101 REF    1             22,2000                    SETLOC    KALCMON2
080102                      22,2405                    BANK

080105 REF    2 LAST  390 TO  396:    261   261*       COUNT*    $$/KALC

0802                        22,2405   66370 C CDUTODCM AXT,1     SSP       SUBROUTINE TO COMPUTE  DIRECTION COSINE
0803                        22,2406   00003 1          OCT       3         MATRIX RELATING S/C AXES TO STABLE
0804   REF    1             22,2407   00051 C                    S1        MEMBER AXES FROM 3 CDU ANGLES IN T(MPAC)
0805                        22,2410   00001 C          OCT       1         SET XR1, S1 AND PD FOR LOOP
0806                        22,2411   00010 C          STORE     7
0807                        22,2412   77601 C          SETPD
0808                        22,2413   00001 0                    0
0809                        22,2414   47133 C LOOPSIN  SLOAD*    RTB
0810                        22,2415   00013 0                    10D,1
0811   REF    3  LAST  278  22,2416   45510 1                    CDULOGIC
0812                        22,2417   00013 C          STORE     10D       LOAD PD WITH 0 SIN(PHI)
0813                        22,2420   65356 1          SIN       PDDL                    2 COS(PHI)
0814                        22,2421   00013 C                    10D                     4 SIN(THETA)
0815                        22,2422   41546 C          COS       PUSH                    6 COS(THETA)
0816                        22,2423   71300 1          TIX,1     DLOAD                   8 SIN(PSI)
0817   REF    1             22,2424   44414 C                    LOOPSIN                10 COS(PSI)
0818                        22,2425   00007 0                    6
0819                        22,2426   72405 C          DMP       SL1
0820                        22,2427   00013 C                    10D
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L ANGLFIND USER'S PAGE NO. 8 E6 S4

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0821                22,2430  10001 1        STORE  0,2
0822                22,2431  77745 1        DLOAD
0823                22,2432  00005 1               4
0824                22,2433  65205 0        DMP    PDDL
0825                22,2434  00001 0               0          (PD6 SIN(THETA)SIN(PHI))
0826                22,2435  00007 0               6
0827                22,2436  41205 0        DMP    DMP
0828                22,2437  00011 1               8D
0829                22,2440  00003 1               2
0830                22,2441  44352 0        SL1    BDSU
0831                22,2442  00015 0               12D
0832                22,2443  77752 1        SL1
0833                22,2444  10003 0        STORE  2,2
0834                22,2445  77745 1        DLOAD
0835                22,2446  00003 1               2
0836                22,2447  65205 0        DMP    PDDL       (PD7 COS(PHI)SIN(THETA)) SCALED 4
0837                22,2450  00005 1               4
0838                22,2451  00007 0               6
0839                22,2452  41205 0        DMP    DMP
0840                22,2453  00011 1               8D
0841                22,2454  00001 0               0
0842                22,2455  77752 1        SL1
0843                22,2456  72415 1        DAD    SL1
0844                22,2457  00017 1               14D
0845                22,2460  10005 0        STORE  4,2
0846                22,2461  77745 1        DLOAD
0847                22,2462  00011 1               8D
0848                22,2463  10007 1        STORE  6,2
0849                22,2464  77745 1        DLOAD
0850                22,2465  00013 0               10D
0851                22,2466  72405 0        DMP    SL1
0852                22,2467  00003 1               2
0853                22,2470  10011 0        STORE  8D,2
0854                22,2471  77745 1        DLOAD
0855                22,2472  00013 0               10D
0856                22,2473  57405 1        DMP    DCOMP
0857                22,2474  00001 0               0
0858                22,2475  77752 1        SL1
0859                22,2476  10013 1        STORE  10D,2
0860                22,2477  77745 1        DLOAD
0861                22,2500  00005 1               4
0862                22,2501  57405 1        DMP    DCOMP
0863                22,2502  00013 0               10D
0864                22,2503  77752 1        SL1
0865                22,2504  10015 1        STORE  12D,2
0866                22,2505  77745 1        DLOAD
0867                22,2506  72405 0        DMP    SL1        (PUSH UP 7)
0868                22,2507  00011 1               8D
0869                22,2510  41325 0        PDDL   DMP        (PD7 COS(PHI)SIN(THETA)SIN(PSI)) SCALE4
0870                22,2511  00007 0               6
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0871                        22,2512  00001 0                 0
0872                        22,2513  72415 1          DAD    SL1          (PUSH UP 7)
0873                        22,2514  77626 0          STADR               C7=COS(PHI)SIN(THETA)SIN(PSI)
0874                        22,2515  67760 1          STORE  14D,2
0875                        22,2516  77745 1          DLOAD
0876                        22,2517  72405 0          DMP    SL1          (PUSH UP 6)
0877                        22,2520  00011 1                 8D
0878                        22,2521  41325 0          PDDL   DMP          (PD6 SIN(THETA)SIN(PHI)SIN(PSI)) SCALE4
0879                        22,2522  00007 0                 6
0880                        22,2523  00003 1                 2
0881                        22,2524  72425 1          DSU    SL1          (PUSH UP 6)
0882                        22,2525  77626 0          STADR
0883                        22,2526  67756 1          STORE  16D,2        C8=-SIN(THETA)SIN(PHI)SIN(PSI)
0884                        22,2527  77616 0          RVQ                  +COS(THETA)COS(PHI)
0885                        22,2530           ENDCCM   EQUALS

0886                        15,2000          BANK   15
0886C1 REF  2 LAST 39C      22,2000          SETLOC KALCMCN1
0886C2                      22,2530          BANK

R0887  CALCULATION OF THE MATRIX DEL.....

R0888          *     *              --T          *
R0889          DEL = (IDMATRIX)COS(A)+UU (1-COS(A))+UX SIN(A)          SCALED 1

R0890          -
R0891          WHERE U IS A UNIT VECTOR (DP SCALED 2) ALONG THE AXIS OF ROTATION.
R0893          A IS THE ANGLE OF ROTATION (DP SCALED 2)
R0894                                   -
R0895          UPON ENTRY THE STARTING ADDRESS OF U IS COF, AND A IS IN MPAC

08955 REF  3 LAST  396 TO  398:    83   344*          COUNT  22/KALC

0896                        22,2530  41401 1 DELCOMP  SETPD  PUSH         MPAC CONTAINS THE ANGLE A
0897                        22,2531  00001 0                 0
0898                        22,2532  65356 1          SIN    PDDL         PD0 = SIN(A)
0899                        22,2533  41546 0          COS    PUSH         PD2 = COS(A)
08995                       22,2534  65302 0          SR2    PDDL         PD2 = COS(A)                    $B
0900                        22,2535  41021 1          BDSU   BOV8         PD4 = 1-COS(A)                  $2
0901  REF  2 LAST  392      22,2536  15330 0                 DPHALF
09014 REF  2 LAST  392      22,2537  45707 0                 SIGNMPAC

R0902  COMPLTE THE DIAGONAL COMPONENTS OF DEL

09024                       22,2540  77725 1          PDDL
0903  REF 34 LAST  394      22,2541  03343 0                 COF
0904                        22,2542  41316 0          DSQ    DMP
0905                        22,2543  00005 1                 4
0906                        22,2544  52415 0          DAD    SL3
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0907                                22,2545  00003 1                 2
0908                                22,2546  77604 0        BOVB
0909  REF   3  LAST  398           22,2547  45707 0                 SIGNMPAC
0910  REF   3  LAST  386           22,2550  17426 1        STODL    DEL          UX UX(U-COS(A)) +COS(A)                  $1
0911  REF  35  LAST  398           22,2551  03345 0                 COF +2
0912                                22,2552  41316 0        DSQ      DMP
0913                                22,2553  00005 1                 4
0914                                22,2554  52415 0        DAD      SL3
0915                                22,2555  00003 1                 2
0916                                22,2556  77604 0        BOVB
0917  REF   4  LAST  399           22,2557  45707 0                 SIGNMPAC
0918  REF   4  LAST  399           22,2560  17436 0        STODL    DEL +8D      UY UY(1-COS(A)) +COS(A)                  $1
0919  REF  36  LAST  399           22,2561  03347 1                 COF +4
0920                                22,2562  41316 0        DSQ      DMP
0921                                22,2563  00005 1                 4
0922                                22,2564  52415 0        DAD      SL3
0923                                22,2565  00003 1                 2
0924                                22,2566  77604 0        BOVB
0925  REF   5  LAST  399           22,2567  45707 0                 SIGNMPAC
0926  REF   5  LAST  399           22,2570  03446 1        STORE    DEL +16D     UZ UZ(1-COS(A)) +COS(A)                  $1

R0927  COMPUTE THE OFF DIAGONAL TERMS OF DEL

0928                                22,2571  41345 0        DLOAD    DMP
0929  REF  37  LAST  399           22,2572  03343 0                 COF
0930  REF  38  LAST  399           22,2573  03345 0                 COF +2
0931                                22,2574  72405 0        DMP      SL1
0932                                22,2575  00005 1                 4
0933                                22,2576  41325 0        PDDL     DMP          D6  UX UY (1-COS A)                      $ 4
0934  REF  39  LAST  399           22,2577  03347 1                 COF +4
0935                                22,2600  00001 0                 0
0936                                22,2601  43206 1        PUSH     DAD          D8  UZ SIN A                         $ 4
0937                                22,2602  00007 0                 6
0938                                22,2603  41112 0        SL2      BOVB
0939  REF   6  LAST  399           22,2604  45707 0                 SIGNMPAC
0940  REF   6  LAST  399           22,2605  17434 1        STODL    DEL +6
0941                                22,2606  62421 1        BDSU     SL2
0942                                22,2607  77604 0        BOVB
0943  REF   7  LAST  399           22,2610  45707 0                 SIGNMPAC
0944  REF   7  LAST  399           22,2611  17430 0        STODL    DEL +2
0945  REF  40  LAST  399           22,2612  03343 0                 COF
0946                                22,2613  41205 0        DMP      DMP
0947  REF  41  LAST  399           22,2614  03347 1                 COF +4
0948                                22,2615  00005 1                 4
0949                                22,2616  65352 0        SL1      PDDL         D6  UX UZ (1-COS A )                     $ 4
0950  REF  42  LAST  399           22,2617  03345 0                 COF +2
0951                                22,2620  41405 0        DMP      PUSH         D8  UY SIN(A)
0952                                22,2621  00001 0                 0
0953                                22,2622  62415 0        DAD      SL2
0954                                22,2623  00007 0                 6
```

```
0955                        22,2624  77604 0        BOVB
0956  REF   8  LAST  399    22,2625  45707 0               SIGNMPAC
0957  REF   8  LAST  399    22,2626  17432 1        STODL  DEL +4          UX UZ (1-COS(A))+UY SIN(A)
0958                        22,2627  62421 1        BDSU   SL2
0959                        22,2630  77604 0        BOVB
0960  REF   9  LAST  400    22,2631  45707 0               SIGNMPAC
0961  REF   9  LAST  400    22,2632  17442 0        STODL  DEL +12D         UX UZ (U-COS(A))-UY SIN(A)
0962  REF  43  LAST  399    22,2633  03345 0               COF +2
0963                        22,2634  41205 0        DMP    DMP
0964  REF  44  LAST  400    22,2635  03347 1               COF +4
0965                        22,2636  00005 1               4
0966                        22,2637  65352 0        SL1    PDDL            D6  UY UZ (1-COS(A))                $ 4
0967  REF  45  LAST  400    22,2640  03343 0               COF
0968                        22,2641  41405 0        DMP    PUSH            D8  UX SIN(A)
0969                        22,2642  00001 0               0
0970                        22,2643  62415 0        DAD    SL2
0971                        22,2644  00007 0               6
0972                        22,2645  77604 0        BOVB
0973  REF  10  LAST  400    22,2646  45707 0               SIGNMPAC
0974  REF  10  LAST  400    22,2647  17444 0        STODL  DEL +14D         UY UZ(1-COS(A)) +UX SIN(A)
0975                        22,2650  62421 1        BDSU   SL2
0976                        22,2651  77604 0        BOVB
0977  REF  11  LAST  400    22,2652  45707 0               SIGNMPAC
0978  REF  11  LAST  400    22,2653  03440 1        STORE  DEL +10D         UY UZ (1-COS(A)) -UX SIN(A)
0979                        22,2654  77616 0        RVQ


R0980   DIRECTION COSINE MATRIX TO CDU ANGLE ROUTINE
R0981   X1 CONTAINS THE COMPLEMENT OF THE STARTING ADDRESS FOR MATRIX (SCALED 2)
R0982   LEAVES CDU ANGLES SCALED 2PI IN V(MPAC)
R0983   COS(MGA) WILL BE LEFT IN S1 (SCALED 1)

R0984   THE DIRECTION COSINE MATRIX RELATING S/C AXES TO STABLE MEMBER AXES CAN BE WRITTEN AS***

R0986           C =COS(THETA)COS(PSI)
R0987            C
R0988           C =-COS(THETA)SIN(PSI)COS(PHI)+SI (THETA)SIN(PHI)
R0989            1
R0990           C =COS(THETA)SIN(PSI)SIN(PHI) + S N(THETA)COS(PHI)
R0991            2
R0992           C =SIN(PSI)
R0993            3
R0994           C =COS(PSI)COS(PHI)
R0995            4
R0996           C =-COS(PSI)SIN(PHI)
R0997            5
R0998           C =-SIN(THETA)COS(PSI)
R0999            6
R1000           C =SIN(THETA)SIN(PSI)COS(PHI)+COS THETA)SIN(PHI)
R1001            7
```

R1002 C =-SIN(THETA)SIN(PSI)SIN(PHI)+CO (THETA)COS(PHI)
R1003 8

R1004 WHERE PHI = CGA
R1005 THETA = IGA
R1006 PSI = MGA

```
 1007                          22,2655  67543 1  DCM1CCDU DLOAD*  ARCSIN
 1008                          22,2656  00007 0                   6,1
 1009                          22,2657  71406 0           PUSH    COS              PD +0   PSI
 1010                          22,2660  41152 1           SL1     BOVB
 1011  REF  12  LAST  40C      22,2661  45707 0                   SIGNMPAC
 1012  REF   2  LAST  396      22,2662  00051 0           STORE   S1
 1013                          22,2663  57543 1           DLOAD*  DCOMP
 1014                          22,2664  00015 0                   12D,1
 1015                          22,2665  67471 1           DDV     ARCSIN
 1016  REF   3  LAST  401      22,2666  00051 0                   S1
 1017                          22,2667  51123 0           PDDL*   BPL              PD +2   THETA
 1018                          22,2670  00001 0                   0,1              MUST CHECK THE SIGN OF COS(THETA)
 1019  REF   1                 22,2671  44703 0                   OKTHETA          TO DETERMINE THE PROPER QUADRANT
 1020                          22,2672  57545 1           DLOAD   DCOMP
 1021                          22,2673  43244 1           BPL     DAD
 1022  REF   1                 22,2674  44700 0                   SUHALFA
 1023  REF   3  LAST  398      22,2675  15330 0                   DPHALF
 1024                          22,2676  77650 1           GOTO
 1025  REF   1                 22,2677  44702 1                   CALCPHI
 1026                          22,2700  77625 0  SUHALFA  DSU
 1027  REF   4  LAST  401      22,2701  15330 0                   DPHALF
 1028                          22,2702  77606 1  CALCPHI  PUSH
 1029                          22,2703  57543 1  OKTHETA  DLOAD*  DCOMP
 1030                          22,2704  00013 0                   10D,1
 1031                          22,2705  67471 1           DDV     ARCSIN
 1032  REF   4  LAST  401      22,2706  00051 0                   S1
 1033                          22,2707  51123 0           PDDL*   BPL              PUSH DOWN PHI
 1034                          22,2710  00011 1                   8D,1
 1035  REF   1                 22,2711  44723 1                   OKPHI
 1036                          22,2712  57545 1           DLOAD   DCOMP            PUSH UP PHI
 1037                          22,2713  43244 1           BPL     DAD
 1038  REF   1                 22,2714  44720 1                   SUHALFAP
 1039  REF   5  LAST  401      22,2715  15330 0                   DPHALF
 1040                          22,2716  77650 1           GOTO
 1041  REF   1                 22,2717  44724 0                   VECOFANG
 1042                          22,2720  52025 1  SUHALFAP DSU     GOTO
 1043  REF   6  LAST  401      22,2721  15330 0                   DPHALF
 1044  REF   2  LAST  401      22,2722  44724 0                   VECOFANG
 1045                          22,2723  77745 1  OKPHI    DLOAD                   PUSH UP PHI
 1046                          22,2724  43466 1  VECOFANG VDEF    RVQ
```

P1047 ROUTINE FOR TERMINATING AUTOMATIC MANEUVERS

```
 10512                          22,2725  0 0004 0  NOGOM2   INHINT                  THIS LOCATION ACCESSED BY A BZMF NOGO -2
 10513  REF   1                 22,2726  0 3272 0           TC       ZEROEROR
 10514                          22,2727  0 0004 0  NOGO     INHINT
 10515  REF   4  LAST  252      22,2730  0 3245 1           TC       STOPRATE

A1052                                                                             TERMINATE MANEUVER
 1053   REF  23  LAST  368      22,2731  3 4711 1           CAF      TWO           NOTE - ALL RETURNS ARE NOW MADE VIA
 1054   REF  14  LAST  377      22,2732  0 5140 1           TC       WAITLIST      GOODEND
 1055   REF   8  LAST  390      E6,1661                     EBANK=   BCDU
 1056   REF   1                 22,2733   03237 1           2CADR    ENDMANU
 1056   REF   1                 22,2734   44106 0
 1058   REF  49  LAST  383      22,2735  1 5112 1           TCF      ENDOFJOB
```

```
0001                          15,2000                    BANK   15
0002   REF   3  LAST  398     22,2000                    SETLOC KALCMCN1
0003                          22,2736                    BANK

0004   REF   9  LAST  402     E6,1661                    EBANK= BCDU
R0005  DETECTING GIMBAL LOCK
0006   REF   1                22,2736          LOCSKIRT EQUALS NOGIMLOC

0007                          22,2736  77614 1 NOGIMLOC SET
0008   REF   1                22,2737  01074 0                  CALCMAN3
0009                          22,2740  70740 0 WCALC    LXC,1   DLOAD*
0010   REF   2  LAST  179     22,2741  01130 1                  RATEINDX
0011   REF   1                22,2742  04772 1                  ARATE,1
0012                          22,2743  45002 1          SR4     CALL          COMPUTE THE INCREMENTAL ROTATION MATRIX
0013   REF   3  LAST  386     22,2744  44530 1                  DELCOMP       DEL CORRESPONDING TO A 1 SEC ROTATION
A0014                                                                        ABOUT COF
0015                          22,2745  74343 0          DLOAD*  VXSC
0016   REF   2  LAST  403     22,2746  04772 1                  ARATE,1
0017   REF  46  LAST  400     22,2747  03343 0                  COF
0018                          22,2750  77721 0          MXV
0019   REF   1                22,2751  05004 0                  QUADROT
0020   REF   1                22,2752  17311 1          STODL   BRATE
0021   REF   4  LAST  391     22,2753  03365 1                  AM
0022                          22,2754  55605 1          DMP     DDV*
0023   REF   1                22,2755  05002 0                  ANGLTIME
0024   REF   3  LAST  403     22,2756  04772 1                  ARATE,1
0025                          22,2757  77661 0          SR
0026                          22,2760  20606 0                  5
0027   REF   1                22,2761  27317 1          STOVL   TM
0028   REF   2  LAST  403     22,2762  03311 1                  BRATE
0029                          22,2763  77761 1          VXSC
0030   REF   1                22,2764  05026 0                  BIASCALE
0031   REF   1                22,2765  03275 1          STORE   BIASTEMP      ATTITUDE ERROR BIAS TO PREVENT OVERSHOOT
A0032                                                                       IN SYSTEM
0033                          22,2766  77614 1          SETGO                 STATE SWITCH CALCMAN2 (43D)
0034   REF   1                22,2767  01035 0                  CALCMAN2      0(OFF) = BYPASS STARTING PROCEDURE
0035   REF   1                22,2770  45033 0                  NEWANGL +1    1(ON) = START MANEUVER


0036                          22,2771  00044 1 ARATE    2DEC    .0022222222   = .05 DEG/SEC
0036                          22,2772  15053 0
0037                          22,2773  00221 0          2DEC    .0088888889   = .2 DEG/SEC
0037                          22,2774  24255 0
0038                          22,2775  00554 0          2DEC    .0222222222   = .5 DEG/SEC
0038                          22,2776  02660 0
0039                          22,2777  05540 0          2DEC    .1777777777   =  4 DEG/SEC          $ 22.5 DEG/SEC
0039                          22,3000  26603 0
0040                          22,3001  00003 1 ANGLTIME 2DEC    .000190735    = 100B - 19
0040                          22,3002  04000 0
A0041                                                                       MANEUVER ANGLE TO MANEUVER TIME
```

```
0042                    22,3003   03146 1  QUADROT  2DEC    .1              ROTATION MATRIX FROM S/C AXES TO CONTROL
0042                    22,3004   14632 0
0043                    22,3005   00000 1           2DEC    0               AXES  (X ROT = -7.25 DEG)
0043                    22,3006   00000 1
0044                    22,3007   00000 1           2DEC    0
0044                    22,3010   00000 1
0045                    22,3011   00000 1           2DEC    0
0045                    22,3012   00000 1
0046                    22,3013   03131 1           2DEC    .099200         =(.1)COS7.25
0046                    22,3014   11275 1
0047                    22,3015   77461 1           2DEC    -.012620        =-(.1)SIN7.25
0047                    22,3016   47370 0
0048                    22,3017   00000 1           2DEC    0
0048                    22,3020   00000 1
0049                    22,3021   00316 0           2DEC    .012620         (.1)SIN7.25
0049                    22,3022   30407 1
0050                    22,3023   03131 1           2DEC    .099200         (.1)COS7.25
0050                    22,3024   11275 1
0051                    22,3025   00004 0  BIASCALE 2DEC    .0002543132     = (450/180)(1/0.6)(1/16384)
0051                    22,3026   05253 0
```

L KALCMANU STEERING USER'S PAGE NO. 1 EO S4

R0001 GENERATION OF STEERING COMMANDS FOR DIGITAL AUTOPILOT FREE FALL MANEUVERS

R0003 NEW COMMANDS WILL BE GENERATED EVERY ONE SECOND DURING THE MANEUVER

```
0004                          15,2000                    BANK   15

0005  REF   4  LAST  403     22,2000                    SETLOC KALCMAN1
0006                          22,3027                    BANK

0007  REF  10  LAST  403     E6,1661                    EBANK= BCDU

0008  REF   4 LAST  398 TO  405:   191   535*           COUNT  22/KALC

0009  REF   2  LAST  391     22,3027   4 1332 0 NEWDELHI CS     HOLDFLAG      SEE IF MANEUVER HAS BEEN INTERRUPTED
0010                          22,3030   0 0006 1         EXTEND                BY ASTRONAUT
0011  REF   2  LAST  391     22,3031   6 2725 0         BZMF   NOGO -2        IF SO, TERMINATE KALCMANU
0012  REF  12  LAST  39C     22,3032   0 6006 1 NEWANGL TC     INTPRET
0013                          22,3033    75160 1         AXC,1  AXC,2
0014  REF  13  LAST  39C     22,3034    03320 0         MIS    COMPUTE THE NEW MATRIX FROM S/C TO
0015  REF  12  LAST  40C     22,3035    03425 1         DEL    STABLE MEMBER AXES
0016                          22,3036    77624 1         CALL
0017  REF   4  LAST  39C     22,3037    44304 0         MXM3
0018                          22,3040    45575 1         VLOAD  STADR
0019  REF  14  LAST  405     22,3041    50442 0         STOVL  MIS +12D       CALCULATE NEW DESIRED CDU ANGLES
0020                          22,3042    77626 0         STADR
0021  REF  15  LAST  405     22,3043    50450 0         STOVL  MIS +6D
0022                          22,3044    77626 0         STADR
0023  REF  16  LAST  405     22,3045    74456 0         STORE  MIS
0024                          22,3046    45160 1         AXC,1  CALL
0025  REF  17  LAST  405     22,3047    03320 0         MIS
0026  REF   2  LAST  386     22,3050    44655 1         DCMTOCDU              PICK UP THE NEW CDU ANGLES FROM MATRIX
0027                          22,3051    77634 0         RTB
0028  REF   2  LAST  386     22,3052    45547 0         V1STO2S
0029  REF   1                 22,3053    03267 1         STORE  NCDU           NEW CDU ANGLES
0030                          22,3054    77414 0         BONCLR EXIT
0031  REF   2  LAST  403     22,3055    01215 0                CALCMAN2
0032  REF   1                 22,3056    45142 1                MANUSTAT       TO START MANEUVER
0033  REF  24  LAST  402     22,3057   3 4711 1         CAF    TWO                    +0 OTHERWISE
0034  REF   2  LAST  111     22,3060   55'664 0 INCRDCDU TS     KSPNDX
0035                          22,3061   6 0000 1         DOUBLE
0036  REF   2  LAST  111     22,3062   55'665 1         TS     KDPNDX
0037  REF   3  LAST  405     22,3063   51'664 1         INDEX  KSPNDX
0038  REF   2  LAST  405     22,3064   3 1666 0         CA     NCDU           NEW DESIRED CDU ANGLES
0039                          22,3065   0 0006 1         EXTEND
0040  REF   4  LAST  405     22,3066   5 1664 1         INDEX  KSPNDX
0041  REF  11  LAST  405     22,3067   21'661 0         MSU    BCDU           INITIAL S/C ANGLE OR PREVIOUS DESIRED
0042                          22,3070   0 0006 1         EXTEND                CDU ANGLES
0043  REF   1                 22,3071   7 3141 1         MP     DT/TAU
0044  REF   3  LAST  405     22,3072   51'665 0         INDEX  KDPNDX
0045  REF   2  LAST  106     22,3073   53'576 0         DXCH   DELCDUX        ANGLE INCREMENTS TO BE ADDED TO
```

```
0046  REF   5  LAST  405   22,3074  51'664 1            INDEX  KSPNDX      DCDU EVERY TENTH SEC
0047  REF   3  LAST  405   22,3075  3 1666 C            CA     NCDU        BY LEM DAP
0048  REF   6  LAST  406   22,3076  51'664 1            INDEX  KSPNDX
0049  REF  12  LAST  405   22,3077  57'661 1            XCH    BCDU
0050  REF   4  LAST  405   22,3100  51'665 C            INDEX  KDPNDX
0051  REF   2  LAST  107   22,3101  55'646 C            TS     CDUXD
0052  REF   7  LAST  406   22,3102  11'664 C            CCS    KSPNDX
0053  REF   1             22,3103  1 3060 C            TCF    INCRDCDU    LOOP FOR THREE AXES

0054                      22,3104  C 0003 1            RELINT
R0055 COMPARE PRESENT TIME WITH TIME TO TERMINATE MANEUVER

0056  REF   1             22,3105  0 3115 1  TMANUCHK  TC     TIMECHK
0057  REF   1             22,3106  1 3206 1            TCF    CONTMANU
0058  REF  52  LAST  391  22,3107  3 4712 1            CAF    ONE
0060  REF  15  LAST  402  22,3110  0 5140 1  MANUSTAL  TC     WAITLIST
0061  REF  13  LAST  406  E6,1661                      EBANK= BCDU
0062  REF   1             22,3111   03232 1            2CADR  MANUSTOP
0062  REF   1             22,3112   44106 C
0063                      22,3113  C 0003 1            RELINT
0064  REF  5C  LAST  402  22,3114  1 5112 1            TCF    ENDOFJOB


0065                      22,3115  C 0006 1  TIMECHK   EXTEND
0066  REF  11  LAST  372  22,3116  4 0025 1            DCS    TIME2
0067  REF   1             22,3117  53'673 C            DXCH   TTEMP
0068                      22,3120  C 0006 1            EXTEND
0069  REF   2  LAST  403  22,3121  3 1717 1            DCA    TM
0070  REF   2  LAST  406  22,3122  21'673 C            DAS    TTEMP
0071  REF   3  LAST  406  22,3123  11'672 1            CCS    TTEMP
0072  REF 13E  LAST  382  22,3124  C 0002 C            TC     Q
0073                      22,3125  1 3127 1            TCF    +2
0074  REF   1             22,3126  1 3137 C            TCF    2NDRETRN
0075  REF   4  LAST  406  22,3127  11'673 C            CCS    TTEMP +1
0076  REF 139  LAST  406  22,3130  C 0002 C            TC     Q
0077  REF   1             22,3131  1 3133 1            TCF    MANUOFF
0078                      22,3132  4 0000 C            COM
0079  REF   1             22,3133  6 3205 C  MANUOFF   AD     ONESEC +1
0080                      22,3134  C 0006 1            EXTEND
0081  REF   2  LAST  406  22,3135  6 3137 1            BZMF   2NDRETRN
0082  REF 14C  LAST  406  22,3136  24 002 C            INCR   Q
0083  REF 141  LAST  406  22,3137  24 002 C  2NDRETRN  INCR   Q
0084  REF 142  LAST  406  22,3140  C 0002 C            TC     Q
0085                      22,3141   03146 1  DT/TAU    DEC    .1

0086                      22,3142   77776 1  MANUSTAT  EXIT                 INITIALIZATION ROUTINE
0087                      22,3143  C 0006 1            EXTEND                FOR AUTOMATIC MANEUVERS
0088  REF  12  LAST  406  22,3144  3 0025 C            DCA    TIME2
0089  REF   3  LAST  406  22,3145  21'717 C            DAS    TM            TM+TO    MANEUVER COMPLETION TIME
0090                      22,3146  C 0006 1            EXTEND
```

```
0091  REF   2  LAST  406   22,3147  4 3205 1          DCS    ONESEC
0092  REF   4  LAST  406   22,3150  21'717 C          DAS    TM              (TM+TO)-1
0093                        22,3151  C 0004 C          INHINT
0094  REF  53  LAST  406   22,3152  4 4712 C          CS     ONE             ENABLE AUTOPILOT TO PERFORM
0095  REF   3  LAST  405   22,3153  55'332 C          TS     HOLDFLAG        AUTOMATIC MANEUVERS
0096  REF   3  LAST  403   22,3154  4 1130 C          CS     RATEINDX        SEE IF MANEUVERING AT HIGH RATE
0097  REF  15  LAST  343   22,3155  6 6211 C          AD     SIX
0098                        22,3156  C 0006 1          EXTEND
0099  REF   1              22,3157  6 3161 1          BZMF   HIGHGAIN
0100                        22,3160  1 3164 C          TCF    +4
0101  REF   1              22,3161  4 1501 C  HIGHGAIN CS     RCSFLAGS        IF SO, SET HIGH RATE FLAG (BIT 15 OF
0102  REF  29  LAST  379   22,3162  7 4674 1          MASK   BIT15           RCSFLAGS)
0103  REF   2  LAST  407   22,3163  27'501 C          ADS    RCSFLAGS
0104  REF   3  LAST  403   22,3164  53'711 C          DXCH   BRATE           X-AXIS MANEUVER RATE
0105  REF   6  LAST  172   22,3165  53'526 C          DXCH   WBODY
0106  REF   4  LAST  407   22,3166  53'713 1          DXCH   BRATE +2        Y-AXIS MANEUVER RATE
0107  REF   1              22,3167  53'530 1          DXCH   WBODY1
0108  REF   5  LAST  407   22,3170  53'715 1          DXCH   BRATE +4        Z-AXIS MANEUVER RATE
0109  REF   2  LAST  105   22,3171  53'532 C          DXCH   WBODY2
0110  REF   2  LAST  403   22,3172  3 1675 1          CA     BIASTEMP +1     INSERT ATTITUDE ERROR BIASES
0111  REF   2  LAST  106   22,3173  55'564 C          TS     BIAS            INTO AUTOPILOT
0112  REF   3  LAST  407   22,3174  3 1677 C          CA     BIASTEMP +3
0113  REF   2  LAST  106   22,3175  55'565 1          TS     BIAS1
0114  REF   4  LAST  407   22,3176  3 1701 C          CA     BIASTEMP +5
0115  REF   2  LAST  106   22,3177  55'566 1          TS     BIAS2
0116  REF   5  LAST  297   22,3200  3 0025 C          CA     TIME1
0117  REF   3  LAST  407   22,3201  6 3205 C          AD     ONESEC +1
0118  REF   1              22,3202  57'671 C          XCH    NEXTIME
0119  REF   2  LAST  406   22,3203  1 3057 1          TCF    INCRCDU -1

0120                        22,3204   00000 1  ONESEC   DEC    0
0121                        22,3205   00144 C           DEC    100

0122                        22,3206  C 0004 C  CONTMANU INHINT                 CONTINUE WITH UPDATE PROCESS
0123  REF   6  LAST  407   22,3207  4 0025 1          CS     TIME1
0124  REF   2  LAST  407   22,3210  6 1671 C          AD     NEXTIME
0125  REF 127  LAST  382   22,3211  10 000 C          CCS    A
0126  REF  54  LAST  407   22,3212  6 4712 1          AD     ONE
0127  REF   1              22,3213  1 3216 C          TCF    MANUCALL
0128  REF   1              22,3214  6 4674 C          AD     NEGMAX
0129                        22,3215  4 0000 C          COM
0130  REF  16  LAST  406   22,3216  0 5140 1  MANUCALL TC     WAITLIST
0131  REF  14  LAST  406   E6,1661              EBANK=   BCDU
0132  REF   1              22,3217   03225 1          2CADR  UPDTCALL
0132  REF   1              22,3220   44106 C
0133                        22,3221  0 0003 1          RELINT
0134  REF   4  LAST  407   22,3222  3 3205 0          CAF    ONESEC +1       INCREMENT TIME FOR NEXT UPDATE
0135  REF   3  LAST  407   22,3223  27'671 1          ADS    NEXTIME
0136  REF  51  LAST  406   22,3224  1 5112 1          TCF    ENDOFJOB
```

```
0137  REF   1                 22,3225  3 7663 C  UPDTCALL CAF     PRIO26          CALL FOR UPDATE
0138  REF  14  LAST  371      22,3226  0 5042 1            TC      FINDVAC         OF STEERING COMMANDS
0139  REF  15  LAST  407      E6,1661                      EBANK=  BCDU
0140  REF   1                 22,3227   03027 1            2CADR   NEWDELHI
0140  REF   1                 22,3230   44106 C
0141  REF  16  LAST  378      22,3231  0 5213 1            TC      TASKOVER
```

P0142 ROUTINE FOR TERMINATING AUTOMATIC MANEUVERS

```
0143   REF   1              22,3232  0 3256 C  MANUSTOP TC    STOPYZ
0144   REF   1              22,3233  0 3303 1           TC    LOADYZ

0145   REF   6  LAST  390   22,3234  3 1155 1  ENDROLL  CA    CPHI
0146   REF   3  LAST  406   22,3235  55'646 C           TS    CDUXD     SET CDUXD TO THE COMMANDED OUTER GIMBAL
0149   REF   5  LAST  402   22,3236  0 3245 1           TC    STOPRATE
0150   REF   1              22,3237  3 1327 C  ENDMANU  CA    ATTPRIO   RESTORE USERS PRIORITY
0151   REF   2  LAST  197   22,3240  54 063 C           TS    NEWPRIO

0152   REF  84  LAST  382   22,3241  3 4714 1           CA    ZERO      ZERO ATTCADR
0153   REF   3  LAST  187   22,3242  53'326 C           DXCH  ATTCADR

0154   REF   2  LAST  197   22,3243  0 5053 1           TC    SPVAC     RETURN TO USER OF GOMANUR

0155   REF  17  LAST  408   22,3244  0 5213 1           TC    TASKOVER

0156   REF  85  LAST  409   22,3245  3 4714 1  STOPRATE CAF   ZERO
0157   REF   3  LAST  405   22,3246  55'575 C           TS    DELCDUX
0158   REF   4  LAST  409   22,3247  55'576 C           TS    DELCDUX +1  ZERO ROLL INCREMENTAL ANGLES
0159   REF   7  LAST  407   22,3250  55'525 C           TS    WBODY     RATE
0160   REF   8  LAST  409   22,3251  55'526 C           TS    WBODY +1
0161   REF   3  LAST  407   22,3252  55'564 C           TS    BIAS      BIAS

01611  REF  30  LAST  407   22,3253  4 4674 1           CS    BIT15     MAKE SURE HIGH RATE FLAG (BIT 15 OF
01612  REF   3  LAST  407   22,3254  7 1501 C           MASK  RCSFLAGS  RCSFLAGS) IS RESET.
01613  REF   4  LAST  409   22,3255  55'501 C           TS    RCSFLAGS

0162   REF  88  LAST  409   22,3256  3 4714 1  STOPYZ   CAF   ZERO
0163   REF   2  LAST  106   22,3257  55'577 1           TS    DELCDUY   ZERO PITCH, YAW
0164   REF   3  LAST  409   22,3260  55'600 1           TS    DELCDUY +1  INCREMENTAL ANGLES
0165   REF   2  LAST  106   22,3261  55'601 0           TS    DELCDUZ
0166   REF   3  LAST  409   22,3262  55'602 C           TS    DELCDUZ +1
0167   REF   2  LAST  407   22,3263  55'527 1           TS    WBODY1    RATES
0168   REF   3  LAST  409   22,3264  55'530 1           TS    WBODY1 +1
0169   REF   3  LAST  407   22,3265  55'531 C           TS    WBODY2
0170   REF   4  LAST  409   22,3266  55'532 C           TS    WBODY2 +1
0171   REF   3  LAST  407   22,3267  55'565 1           TS    BIAS1     BIASES
0172   REF   3  LAST  407   22,3270  55'566 1           TS    BIAS2
0173   REF 143  LAST  406   22,3271  0 0002 C           TC    Q

0174   REF   7  LAST  396   22,3272  3 0032 0  ZERCEROR CA    CDUX      PICK UP CDU ANGLES AND STORE IN
0175   REF   4  LAST  409   22,3273  55'646 C           TS    CDUXD     CDU DESIRED
0176   REF   2  LAST  218   22,3274  3 0033 1           CA    CDUY
0177   REF   2  LAST  107   22,3275  55'650 1           TS    CDUYD
0178   REF   6  LAST  396   22,3276  3 0034 C           CA    CDUZ
0179   REF   2  LAST  107   22,3277  55'652 C           TS    CDUZD
0180   REF 144  LAST  409   22,3300  0 0002 C           TC    Q
```

```
0181   REF   7  LAST  409   22,3301  3 1155 1  LOADCDUD  CA    CPHI      STORE TERMINAL ANGLES INTO
0182   REF   5  LAST  409   22,3302  55'646 0             TS    CDUXD     COMMAND ANGLES
0183   REF   1              22,3303  3 1156 1  LOADYZ    CA    CTHETA
0184   REF   3  LAST  409   22,3304  55'650 1             TS    CDUYD
0185   REF   1              22,3305  3 1157 0             CA    CPSI
0186   REF   3  LAST  409   22,3306  55'652 0             TS    CDUZD
0187   REF 145  LAST  409   22,3307  0 0002 0             TC    Q
```

```
 0001   REF  15  LAST  241   E5,1671                    EBANK= XSM

 0002                        33,2000                    BANK   33
 0003   REF   1              04,2000                    SETLOC E/PROG
 0004                        04,2557                    BANK

 0005   REF   1                                         COUNT* $$/P07

R0006           SPECIAL PROGRAMS TO EASE THE PANGS OF ERASABLE MEMORY PROGRAMS.

R0007   E/BKCALL   FOR DOING BANKCALLS FROM AND RETURNING TO ERASABLE.

R0008           THIS ROUTINE IS CALLABLE FROM ERASABLE OR FIXED.  LIKE BANKCALL, HOWEVER, SWITCHING BETWEEN S3 AND S4
R0010   IS NOT POSSIBLE.

R0011           THE CALLING SEQUENCE IS:

A0012                                                   TC     BANKCALL
A0013                                                   CADR   E/BKCALL
A0014                                                   CADR   ROUTINE          WHERE YOU WANT TO GO IN FIXED.
A0015                                                   RETURN HERE FROM DISPLAY TERMINATE, BAD STALL OR TC Q.
A0016                                                   RETURN HERE FROM DISPLAY PROCEED OR GOOD RETURN FROM STALL.
A0017                                                   RETURN HERE FROM DISPLAY ENTER OR RECYCLE.

R0018           THIS ROUTINE REQUIRES TWO ERASABLES (EBUF2, +1) IN UNSWITCHED WHICH ARE UNSHARED BY INTERRUPTS AND
R0020   OTHER EMERGRY PROGRAMS.

R0021           A + L ARE PRESERVED THROUGH BANKCALL AND E/BKCALL.

 0022   REF   3  LAST  382   04,2557  52 134 C  E/BKCALL DXCH   BUF2          SAVE A,L AND GET DP RETURN.
 0023   REF   1              04,2560  52 365 C            DXCH   EBUF2         SAVE DP RETURN.
 0024   REF   2  LAST  411   04,2561  24 364 C            INCR   EBUF2         RETURN +1 BECAUSE DOUBLE CADR.
 0025   REF  12  LAST  366   04,2562  3 0006 1            CA     BBANK
 0026   REF   5  LAST  365   04,2563  7 4747 C            MASK   LOW10         GET CURRENT EBANK.  (SBANK SOMEDAY)
 0027   REF   3  LAST  411   04,2564  26 365 C            ADS    EBUF2 +1      FORM BBCON.  (WAS FBANK)
 0028   REF   4  LAST  411   04,2565  5C 364 C            NDX    EBUF2
 0029                        04,2566  2'7777 C            CA     0 -1          GET CADR OF ROUTINE.
 0030   REF   2  LAST  184   04,2567  0 4561 1            TC     SWCALL        GO TO ROUTINE, SETTING Q TO SWRETURN
A0031                                                                          AND RESTORING A + L.
 0032                        04,2570  0 2574 C            TC     +4            TX Q, V34, OR BAD STALL RETURN.
 0033                        04,2571  0 2573 1            TC     +2            PROCEED OR GOOD STALL RETURN.
 0034   REF   5  LAST  411   04,2572  24 364 C            INCR   EBUF2         ENTER OR RECYCLE RETURN.
 0035   REF   6  LAST  411   04,2573  24 364 C            INCR   EBUF2
 0036   REF   7  LAST  411   04,2574  52 365 C  E/SWITCH DXCH   EBUF2
 0037                        04,2575  52 006 C            DTCB
```

L SYSTEM TEST STANDARD LEAD INS USER'S PAGE NO. 2 E5 S4

P0038 E/CALL FOR CALLING A FIXED MEMORY INTERPRETIVE SUBROUTINE FROM ERASABLE AND RETURNING TO ERASABLE.

R0040 THE CALLING SEQUENCE IS...

```
A0041                                          RTB
A0042                                               E/CALL
A0043                                          CADR  ROUTINE      THE INTERPRETIVE SUBROUTINE YOU WANT.
A0044                                                             RETURNS HERE IN INTERPRETIVE.

 0045  REF   3  LAST  368   04,2576  22 164 1  E/CALL  LXCH  LOC        ADRES -1 OF CADR.
 0046  REF  45  LAST  374   04,2577  50 001 0          INDEX L
 0047  REF  46  LAST  412   04,2600  3 0001 0          CA    L          CADR IN A.
 0048  REF  47  LAST  412   04,2601  24 001 0          INCR  L
 0049  REF  48  LAST  412   04,2602  24 001 0          INCR  L          RETURN ADRES IN L.
 0050  REF   8  LAST  411   04,2603  52 365 0          DXCH  EBUF2      STORE CADR AND RETURN.
 0051  REF  13  LAST  405   04,2604  0 6006 1          TC    INTPRET
 0052                       04,2605   77624 1         CALL
 0053  REF   9  LAST  412   04,2606   00364 0               EBUF2      INDIRECTLY EXECUTE ROUTINE.  IT MUST
 0054                       04,2607   77776 1         EXIT             LEAVE VIA RVQ OR EQUIVALENT.
 0055  REF  10  LAST  412   04,2610  22 365 1          LXCH  EBUF2 +1   PICK UP RETURN.
 0056  REF  14  LAST  412   04,2611  1 6010 1          TCF   INTPRET +2 SET LOC AND RETURB TO CALLER
```

L SYSTEM TEST STANDARD LEAD INS USER'S PAGE NO. 3 E5 S4

```
P0057   E/JOBWAK        FOR WAKING UP ERASABLE MEMORY JOBS.
R0058           THIS ROUTINE MUST BE CALLED IN INTERRUPT OR WITH INTERRUPTS INHIBITED.
R0060           THE CALLING SEQUENCE IS:
A0061                                              INHINT
A0062                                                .
A0063                                                .
A0064                                              CA      WAKEADR         ADDRESS OF SLEEPING JOB
A0065                                              TC      IBNKCALL
A0066                                              CADR    E/JOBWAK
A0067                                                .                     RETURNS HERE
A0068                                                .
A0069                                                .
A0070                                              RELINT                  IF YOU DID AN INHINT.

 0071                       33,2000                BANK    33
 0072   REF   2 LAST  411   04,2000                SETLOC  E/PROG
 0073                       04,2612                BANK

 0074   REF   2 LAST  411 TC  413:    27    27*    COUNT*  $$/P07

 0075   REF   3 LAST  375   04,2612  0 5074 1  E/JOBWAK TC      JOBWAKE         ARRIVE IWTH ADRES IN A.
 0076   REF  17 LAST  341   04,2613  4 4700 C          CS      BIT11
 0077   REF   4 LAST  368   04,2614  5C 064 C          NDX     LOCCTR
 0078   REF   4 LAST  412   04,2615  26 164 C          ADS     LOC             KNOCK FIXED MEMORY BIT OUT OF ADRES.
 0079   REF   1             04,2616  0 0072 1          TC      RUPTREG3        RETURN

R0080   THESE PROGRAMS ARE PROVIDED TO ALLOW OVERLAY OF BANKS 30 THRU 33 OF THE 205 VERSIONS OF SYSTEM TESTS AND
R0082   PRELAUNCH ALIGN.  THE INTENT IS TO ALLOW THE STG AND HYBRID LABS TO RUN ALL THE TESTS WITH COLOSSUS.

 0084                       33,2000                BANK    33
 0085   REF   1             33,2000                SETLOC  TESTLEAD
 0086                       33,2000                BANK

 0087   REF   1                                    COUNT   33/CONST

 0088   REF   5 LAST  240   E5,1425                EBANK=  QPLACE

 0089   REF   1             33,2000  0 3426 1  COMPVER  TC      GCOMPVER        MUST BE 33,2000.

 0090   REF   1             33,2001  0 3133 0  GTSCPSS1 TC      GTSCPSS         MUST BE AT 33,2001

 0091   REF   1             33,2002  0 5243 1  REDO     TC      NEWMODEX        DISPLAY MM 07.
 0092                       33,2003   00007 0           MM      07              FALL INTO INITEST
```

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R0010   NAME- IMU PERFORMANCE TESTS 2

R0011   DATE- MARCH 20,1967

R0012   BY- SYSTEM TEST GROUP 864-6900 EXT. 1274

R0013   MCDNC.- ZERO

R0014   FUNCTIONAL DESCRIPTION

R0015   POSITIONING ROUTINES FOR THE IMU PERFORMANCE TESTS AS WELL AS SOME OF
R0016   THE TESTS THEMSELVES. FOR A DESCRIPTION OF THESE SUBROUTINES AND THE
R0017   OPERATING PROCEDURES (TYPICALLY) SEE STG MEMO 685.THEORETICAL REF.E-1973

 0018                          33,2004                          BANK   33
 0019   REF   1                33,2000                          SETLOC IMUCAL
 0020                          33,2004                          BANK

 0021   REF   1                E5,1423                          EBANK= POSITON
 0022   REF  67  LAST  409     33,2004  3 4714 1  IMUTEST      CA     ZERO
 0023   REF   1                33,2005  55'452 1                 TS     DRIFTT
 0024   REF   1                33,2006  55'643 0                 TS     GEOCOMP1
00241   REF   1                33,2007  3 2443 0                 CAF    TESTTIME
00242   REF   1                33,2010  55'412 0                 TS     LENGTHOT
00243   REF   1                33,2011  0 2302 1                 TC     COAALIGN       TAKE CARE OF DRIFT FLAG
 0025   REF   1                33,2012  3 4734 0                 CAF    1SECX
 0026   REF   1                33,2013  55'644 1                 TS     1SECXT1

00261   REF   1                33,2014  3 2441 1                 CA     OC144CO
00262   REF   7  LAST  299     33,2015  55'074 1                 TS     1/PIPADT
 0027   REF  15  LAST  412     33,2016  0 6006 1  GUESS          TC     INTPRET        CALCULATE -COS LATITUDE AND SIN LATITUDE
0027C1                         33,2017   77624 1                 CALL
 0028   REF   1                33,2020   10617 0                 LATAZCHK
 0029                          33,2021   57546 1                 COS    DCOMP
 0030                          33,2022   77752 1                 SL1
 0031   REF   1                33,2023   16447 1                 STODL  WANGI
 0032   REF   1                33,2024   02403 1                 LATITUDE
 0033                          33,2025   72556 1                 SIN    SL1
 0034   REF   1                33,2026   02445 0                 STORE  WANGC
 0035                          33,2027   77776 1                 EXIT
 0036   REF  59  LAST  389     33,2030  0 4555 0  GEOIMUTT       TC     BANKCALL       GYROCOMPASS COMES IN HERE
 0037   REF   2  LAST  232     33,2031   16516 1                 CADR   IMUZERO
 0038   REF   1                33,2032  0 2316 1                 TC     IMUSTALL
 0039   REF  88  LAST  414     33,2033  3 4714 1  IMUBACK        CA     ZERO
 0040   REF   1                33,2034  55'421 0                 TS     NDXCTR
 0041   REF   1                33,2035  55'450 0                 TS     TORQNDX
 0042   REF   2  LAST  414     33,2036  55'451 1                 TS     TORQNDX +1
 0043   REF   1                33,2037  3 4375 1  NBPOSPL        CA     DEC17
 0044   REF   1                33,2040  55'655 1                 TS     ZERONDX1
 0045   REF   1                33,2041  3 2445 0                 CA     XNBADR
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0046   REF   1                  33,2042  0 2356 0     TC      ZEROING
0047   REF   1                  33,2043  3 4675 1     CA      HALF
0048   REF   2  LAST  280       33,2044  55'713 1     TS      XNB
0049   REF  16  LAST  414       33,2045  0 6006 1     TC      INTPRET
0050                             33,2046   73545 1     DLOAD   SIN
0051   REF   1                  33,2047   02401 0             AZIMUTH
0052   REF   2  LAST  280       33,2050   02724 1     STORE   YNB +2
0053   REF   2  LAST  280       33,2051   16734 0     STODL   ZNB +4
0054   REF   2  LAST  415       33,2052   02401 0             AZIMUTH
0055                             33,2053   77746 1     COS
0056   REF   3  LAST  415       33,2054   02726 0     STORE   YNB +4
0057                             33,2055   77676 0     DCOMP
0058   REF   3  LAST  415       33,2056   02732 0     STORE   ZNB +2
00581                            33,2057   77776 1     EXIT
00582  REF   8  LAST  260       33,2060  0 5253 0     TC      CHECKMM
00583                            33,2061   00003 1     MM      03          SEE IF IN OPTICAL VERIFICATION
00584                            33,2062  1 2064 0     TCF     +2          NO
00585  REF   1                  33,2063  1 3433 1     TCF     SETNBPOS +1   YES
00586  REF  17  LAST  415       33,2064  0 6006 1     TC      INTPRET
00587                            33,2065   77624 1     CALL
0059   REF   1                  33,2066   47244 0             CALCGA
0060                             33,2067   77776 1     EXIT
0061   REF  60  LAST  414       33,2070  0 4555 0     TC      BANKCALL
0062   REF   2  LAST  234       33,2071   16602 1     CADR    IMUCOARS
0063   REF  35  LAST  375       33,2072  3 4675 1     CAF     BIT14       IF BIT14 SET, GIMBAL LOCK
0064   REF   1                  33,2073  7 0077 0     MASK    FLAGWRD3
0065                            33,2074  0 0006 1     EXTEND
0066                            33,2075  1 2077 1     BZF     +2
0067   REF   2  LAST  414       33,2076  25'421 1     INCR    NDXCTR      +1 IF IN GIMBAL LOCK,OTHERWISE 0
0068   REF  19  LAST  382       33,2077  0 5447 0     TC      DOWNFLAG    RESET GIMBAL LOCK FLAG
0069   REF   1                  33,2100   00056 1     ADRES   GLOKFAIL    BIT 14 FLAG 3
0070   REF   2  LAST  414       33,2101  0 2316 1     TC      IMUSTLLG
0071   REF   3  LAST  415       33,2102  11'421 0     CCS     NDXCTR      IF ONE GO AND DO A PIPA TEST ONLY
0072   REF   1                  33,2103  0 2131 0     TC      PIPACHK     ALIGN AND MEASURE VERTICAL PIPA RATE
0074   REF  61  LAST  415       33,2104  0 4555 0     TC      BANKCALL
0075   REF   2  LAST  236       33,2105   17012 1     CADR    IMUFINE
0076   REF   3  LAST  415       33,2106  0 2316 1     TC      IMUSTLLG
0077                            33,2107  0 0006 1     EXTEND
00771  REF   1                  33,2110  3 1657 1     DCA     PERFCLAY
00772  REF   1                  33,2111  0 5231 1     TC      LONGCALL
00773  REF   2  LAST  414       E5,1423              EBANK=  POSITCN
00774  REF   1                  33,2112   02116 0     2CADR   GOESTIMS
00774  REF   1                  33,2113   66065 1
00775  REF   1                  33,2114  3 2121 1     CA      ESTICADR
00776  REF   3  LAST  374       33,2115  0 5070 0     TC      JOBSLEEP
00777  REF   2  LAST  415       33,2116  3 2121 1 GOESTIMS CA  ESTICADR
00778  REF   4  LAST  413       33,2117  0 5074 1     TC      JOBWAKE
00779  REF  18  LAST  409       33,2120  0 5213 1     TC      TASKOVER
007791 REF   1                  33,2121   66453 0 ESTICADR CADR ESTIMS
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0078   REF  89  LAST  414   33,2122  3 4714 1  TORQUE   CA      ZERO
0079   REF   7  LAST  276   33,2123  55'050 1           TS      DSPTEM2
0080   REF   1              33,2124  3 1514 0           CA      DRIFTI
0081   REF   8  LAST  416   33,2125  55'051 0           TS      DSPTEM2 +1
0082   REF   3  LAST  415   33,2126  51'423 0           INDEX   POSITON
0083   REF   2  LAST   95   33,2127  55'430 0           TS      SOUTHDR -1
0084   REF   1              33,2130  0 2427 1           TC      SHOW

0085   REF   4  LAST  415   33,2131  51'421 1  PIPACHK  INDEX   NDXCTR          PIPA TEST
0086                        33,2132  0 2133 1           TC      +1
0087   REF   1              33,2133  0 2417 1           TC      EARTHR*
0090   REF   1              33,2134  3 4374 0           CA      DEC57
0091   REF   2  LAST  414   33,2135  55'412 0           TS      LENGTHCT
0092   REF  55  LAST  407   33,2136  3 4712 1           CA      ONE
0093   REF   1              33,2137  55'547 1           TS      RESULTCT
0094   REF  90  LAST  416   33,2140  3 4714 1           CA      ZERO
0095   REF   1              33,2141  51'422 1           INDEX   PIPINDEX
0096   REF   2  LAST  264   33,2142  54 037 1           TS      PIPAX
0097   REF   1              33,2143  55'502 0           TS      DATAPL
00971  REF   2  LAST  416   33,2144  55'506 1           TS      DATAPL +4
0098   REF   1              33,2145  0 2321 0           TC      CHECKG          PIP PULSE CATCHING ROUTINE
0099                        33,2146  0 0004 0           INHINT
0100   REF  25  LAST  405   33,2147  3 4711 1           CAF     TWO
0101   REF   1              33,2150  0 5130 0           TC      TWIDDLE
0102   REF  16  LAST  411   E5,1671                     EBANK=  XSM
0103   REF   1              33,2151   02153 1           ADRES   PIPATASK
0105   REF  52  LAST  407   33,2152  0 5112 0           TC      ENDOFJOB
0106                        33,2153  0 0006 1  PIPATASK EXTEND
0107   REF   3  LAST  416   33,2154  27'412 0           DIM     LENGTHCT
01071  REF   4  LAST  416   33,2155  3 1412 1           CA      LENGTHCT
0108                        33,2156  0 0006 1           EXTEND
0109   REF   1              33,2157  6 2163 1           BZMF    STARTPIP
0110   REF  27  LAST  379   33,2160  3 4701 0           CAF     BIT10
0111   REF   2  LAST  416   33,2161  0 5130 0           TC      TWIDDLE
0112   REF  17  LAST  416   E5,1671                     EBANK=  XSM
0113   REF   2  LAST  416   33,2162   02153 1           ADRES   PIPATASK
0114   REF   2  LAST  240   33,2163  3 4675 1  STARTPIP CAF     PRIO20
0115   REF  15  LAST  408   33,2164  0 5042 1           TC      FINDVAC
0116   REF  18  LAST  416   E5,1671                     EBANK=  XSM
0117   REF   1              33,2165   02170 0           2CADR   PIPJOBB
0117   REF   1              33,2166   66065 1
0118   REF  19  LAST  415   33,2167  0 5213 1           TC      TASKOVER
0119   REF   5  LAST  416   33,2170  51'421 1  PIPJOBB  INDEX   NDXCTR
0120                        33,2171  0 2172 1           TC      +1
0121   REF   2  LAST  416   33,2172  0 2417 1           TC      EARTHR*
0122   REF   5  LAST  416   33,2173  3 1412 1           CA      LENGTHCT
0123                        33,2174  0 0006 1           EXTEND
0124                        33,2175  6 2177 1           BZMF    +2
0125   REF  53  LAST  416   33,2176  0 5112 0           TC      ENDOFJOB
0126   REF   7  LAST  336   33,2177  3 4715 0           CA      FIVE
```

```
0127  REF   2  LAST  416   33,2200  55'547 1            TS      RESULTCT
0128  REF   2  LAST  416   33,2201  0 2321 0            TC      CHECKG
0134                       33,2202  0 0006 1            EXTEND
0135  REF   3  LAST  416   33,2203  4 1503 1            DCS     DATAPL
0136  REF   4  LAST  417   33,2204  21'507 0            DAS     DATAPL +4

0137  REF  18  LAST  415   33,2205  0 6006 1            TC      INTPRET
0138                       33,2206   45345 1            DLOAD   DSU
0139  REF   5  LAST  417   33,2207   02511 0                    DATAPL +6
0140  REF   6  LAST  417   33,2210   02505 0                    DATAPL +2
0141                       33,2211   45044 0            BPL     CALL
0142  REF   1              33,2212   66214 0                    AINGOTN
0143  REF   1              33,2213   66276 1                    OVERFFIX
0144                       33,2214   56325 0  AINGOTN   PDDL    DDV
0145  REF   7  LAST  417   33,2215   02507 1                    DATAPL +4
0146                       33,2216   57212 1            SL4     DMPR
0147  REF   1              33,2217   27112 0                    DEC585          DEC585 HAS BEEN REDEFINED FOR LEM
0148                       33,2220   77634 0            RTB
0149  REF   1              33,2221   45541 0                    SGNAGREE
0150  REF   9  LAST  416   33,2222   01051 1            STORE   DSPTEM2
0151                       33,2223   77776 1            EXIT
0152  REF   6  LAST  416   33,2224  11'421 0            CCS     NDXCTR
0153  REF   2  LAST  414   33,2225  0 2302 1            TC      COAALIGN        TAKE PLATFORM OUT OF GIMBAL LOCK
0154  REF   2  LAST  416   33,2226  0 2427 1            TC      SHOW
0155  REF   1              33,2227  3 2447 1  VERTDRFT  CA      3990DEC         ABOUT 1 HOUR VERTICAL DRIFT TEST
0156  REF   6  LAST  416   33,2230  55'412 0            TS      LENGTHOT
0157  REF   4  LAST  416   33,2231  51'423 0            INDEX   POSITCN
0158  REF   3  LAST  416   33,2232  4 1427 0            CS      SOUTHDR -2
0159  REF   2  LAST  414   33,2233  55'452 1            TS      DRIFTT
0160  REF  19  LAST  416   33,2234  3 1675 1            CA      XSM +4          0 IF POSN 4
0161                       33,2235  0 0006 1            EXTEND
0162  REF   1              33,2236  1 2244 0            BZF     PON2
0163  REF  20  LAST  382   33,2237  4 4706 0  PON4      CS      BIT5                    OFFSET PLATFORM
0164  REF   1              33,2240  27'651 0            ADS     ERCOMP1 +2
0165  REF  21  LAST  417   33,2241  3 4706 1            CA      BIT5
0166  REF   2  LAST  417   33,2242  27'647 1            ADS     ERCOMP1
0167  REF   1              33,2243  1 2250 0            TCF     PONG
0168  REF  22  LAST  417   33,2244  4 4706 0  PON2      CS      BIT5
0169  REF   3  LAST  417   33,2245  27'651 0            ADS     ERCOMP1 +2
0170  REF  23  LAST  417   33,2246  3 4706 1            CA      BIT5
0171  REF   4  LAST  417   33,2247  27'653 1            ADS     ERCOMP1 +4
0172  REF   3  LAST  416   33,2250  0 2417 1  PONG      TC      EARTHR*
0173  REF  91  LAST  416   33,2251  3 4714 1            CA      ZERO            ALLOW ONLY SOUTH GYRO EARTH RATE COMPENS
0174  REF   1              33,2252  55'404 1            TS      ERVECTOR
0175  REF   2  LAST  417   33,2253  55'405 0            TS      ERVECTOR +1
0176  REF  10  LAST  342   33,2254  3 4672 0  GUESS1    CAF     POSMAX
0177  REF   3  LAST  414   33,2255  55'450 0            TS      TORQNDX
0178  REF   4  LAST  417   33,2256  55'451 1            TS      TORQNDX +1
0179  REF   8  LAST  409   33,2257  3 0032 0            CA      COUX
0180  REF   2  LAST   95   33,2260  55'413 1            TS      LOSVEC
```

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0181   REF   2  LAST  415   33,2261  0 2453 1          TC     ESTIMS
0184   REF   1              33,2262  3 1512 C  VALMIS  CA     DRIFTO
0185   REF  10  LAST  417   33,2263  55'051 C          TS     DSPTEM2 +1
0186   REF  92  LAST  417   33,2264  3 4714 1          CA     ZERO
0187   REF  11  LAST  418   33,2265  55'050 1          TS     DSPTEM2
0188   REF   3  LAST  417   33,2266  0 2427 1          TC     SHOW

01894  REF  20  LAST  415   33,2267  0 5447 C  ENDTEST1 TC     DOWNFLAG       IMU NOT IN USE
0190   REF   3  LAST  252   33,2270   00007 C          ADRES  IMUSE          BIT 8 FLAG 0
0191   REF  93  LAST  418   33,2271  4 4714 C          CS     ZERO
0192   REF   2  LAST  413   33,2272  0 5246 1          TC     NEWMODEX +3
0193   REF  62  LAST  415   33,2273  0 4555 C          TC     BANKCALL
0194   REF   1              33,2274   16063 0          CADR   MKRELEAS
0195   REF  18  LAST  389   33,2275  0 5423 1          TC     ENDEXT
```

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0196                                33,2276   43215 C  OVERFFIX DAD     DAD
0197  REF   1                      33,2277   15340 1                    DPPOSMAX
0198  REF   1                      33,2300   27120 1                    ONEDPP
0199                                33,2301   77616 C           RVQ

0200                                33,2302   0 0006 1  COAALIGN EXTEND                  COARSE ALIGN SUBROUTINE
0201  REF   6  LAST  413           33,2303   23'425 C            QXCH   QPLACE
0202  REF  94  LAST  418           33,2304   3 4714 1            CA     ZERO
0203  REF  10  LAST  264           33,2305   55'155 C            TS     THETAD
0204  REF  11  LAST  419           33,2306   55'156 C            TS     THETAD +1
0205  REF  12  LAST  419           33,2307   55'157 1            TS     THETAD +2
0206  REF  63  LAST  418           33,2310   0 4555 C            TC     BANKCALL
0207  REF   3  LAST  415           33,2311    16602 1            CADR   IMUCCARS
0208  REF  64  LAST  419           33,2312   0 4555 C            TC     BANKCALL
0209  REF   6  LAST  296           33,2313    17516 C            CADR   IMUSTALL
0210  REF   1                      33,2314   0 3104 1            TC     SOMERR2
0211  REF   7  LAST  419           33,2315   0 1425 C            TC     QPLACE

0212                                33,2316   0 0006 1  IMUSTLLG EXTEND
0213  REF   8  LAST  419           33,2317   23'425 C            QXCH   QPLACE
0214  REF   3  LAST  417           33,2320   0 2312 C            TC     COAALIGN +10

0215                                33,2321   0 0006 1  CHECKG   EXTEND                  PIP PULSE CATCHING ROUTINE
0216  REF   9  LAST  419           33,2322   23'425 C            QXCH   QPLACE
0217                                33,2323   0 2331 1            TC     +6
0218                                33,2324   0 0003 1  CHECKG1  RELINT
0219  REF   2  LAST  186           33,2325   3 0067 C            CA     NEWJOB
0220                                33,2326   0 0006 1            EXTEND
02201                               33,2327   6 2335 C            BZMF   +6
02202 REF   1                      33,2330   C 5057 C            TC     CHANG1
02203                               33,2331   0 0004 C            INHINT
02204 REF   2  LAST  416           33,2332   51'422 1            INDEX  PIPINDEX
02205 REF   3  LAST  416           33,2333   4 0037 1            CS     PIPAX
02206 REF   2  LAST   97           33,2334   55'655 1            TS     ZERONDX
0224                                33,2335   0 0004 0            INHINT
0225  REF   3  LAST  419           33,2336   51'422 1            INDEX  PIPINDEX
0226  REF   4  LAST  419           33,2337   3 0037 C            CA     PIPAX
0227  REF   1                      33,2340   6 1430 1            AD     STOREPL
0228                                33,2341   0 0006 1            EXTEND
0229  REF   1                      33,2342   1 2324 1            BZF    CHECKG1
0230  REF   4  LAST  419           33,2343   51'422 1            INDEX  PIPINDEX
0231  REF   5  LAST  419           33,2344   3 0037 C            CA     PIPAX
0232  REF   3  LAST  417           33,2345   51'547 C            INDEX  RESULTCT
0233  REF   8  LAST  417           33,2346   55'502 C            TS     DATAPL
0234  REF   1                      33,2347   0 4526 1            TC     FINETIME
0235  REF   4  LAST  419           33,2350   51'547 0            INDEX  RESULTCT
0236  REF   9  LAST  419           33,2351   55'503 1            TS     DATAPL +1
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0237   REF   5  LAST  419   33,2352  51'547 C            INDEX  RESULTCT
0238   REF  10  LAST  419   33,2353  23'504 1            LXCH   DATAPL +2
0239                        33,2354  0 0003 1            RELINT
0240   REF  10  LAST  419   33,2355  0 1425 0  ENDCHKG    TC     QPLACE


0241   REF  49  LAST  412   33,2356  54 001 1  ZEROING    TS     L
0242                        33,2357  1 2361 C            TCF    +2
0243   REF   2  LAST  414   33,2360  55'655 1  ZEROING1   TS     ZERONDX1
0244   REF  55  LAST  419   33,2361  3 4714 1            CAF    ZERO
0245   REF  50  LAST  420   33,2362  50 001 C            INDEX  L
0246                        33,2363  54 000 C            TS     0
0247   REF  51  LAST  420   33,2364  24 001 C            INCR   L
0248   REF   3  LAST  420   33,2365  11'655 1            CCS    ZERONDX1
0249   REF   1              33,2366  1 2360 1            TCF    ZEROING1
0250   REF 146  LAST  410   33,2367  0 0002 C            TC     Q
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0251  REF  1                32,2000                          SETLOC  IMUCAL3
0252                        32,2000                          BANK
0254                        32,2000   65345 C  ERTHRVSE      DLOAD   PDDL
0255  REF  1                32,2001   27113 1                SCHZEROS        PD24 = (SIN          -COS    0)(OMEG/MS)
0256  REF  2  LAST  414     32,2002   02403 1                LATITUDE
0257                        32,2003   57546 1          COS   DCOMP
0258                        32,2004   73525 1          PDDL  SIN
0259  REF  3  LAST  421     32,2005   02403 1                LATITUDE
0260                        32,2006   74266 0          VDEF  VXSC
0261  REF  1                32,2007   26450 1                OMEG/MS
0262  REF  3  LAST  417     32,2010   02405 1          STORE ERVECTOR
0263                        32,2011   77634 0          RTB
0264  REF  1                32,2012   45505 0                LOADTIME
0265  REF  1                32,2013   26443 0          STOVL TMARK
0266  REF  2  LAST  421     32,2014   27113 1                SCHZEROS
0267  REF  5  LAST  417     32,2015   02650 0          STORE ERCOMP1
0268                        32,2016   77616 0          RVQ
0269  REF  2  LAST  414     33,2000                          SETLOC  IMUCAL
0270                        33,2370                          BANK
0272                        33,2370   47020 0  EARTHR  ITA   RTB             CALCULATES AND COMPENSATES EARTH RATE
0273  REF  1                33,2371   00051 0                S2
0274  REF  2  LAST  421     33,2372   45505 0                LOADTIME
0275  REF  1                33,2373   02441 1          STORE TEMPTIME
0276                        33,2374   51025 1          DSU   BPL
0277  REF  2  LAST  421     33,2375   02443 0                TMARK
0278  REF  1                33,2376   66401 1                ERTHR
0279                        33,2377   77624 1          CALL
0280  REF  2  LAST  417     33,2400   66276 1                OVERFFIX
0281                        33,2401   74261 1  ERTHR   SL    VXSC
0282                        33,2402   20212 1                9D
0283  REF  4  LAST  421     33,2403   02405 1                ERVECTOR
0284                        33,2404   53321 1          MXV   VAD
0285  REF  20  LAST  417    33,2405   02672 0                XSM
0286  REF  6  LAST  421     33,2406   02650 0                ERCOMP1
0287  REF  7  LAST  421     33,2407   16650 0          STODL ERCOMP1
0288  REF  2  LAST  421     33,2410   02441 1                TEMPTIME
0289  REF  3  LAST  421     33,2411   02443 0          STORE TMARK
0290                        33,2412   47170 1          AXT,1 RTB
0291  REF  8  LAST  421     33,2413   02647 0          ECADR ERCOMP1
0292  REF  1                33,2414   45650 0                PULSEIMU
0293                        33,2415   77650 1          GOTO
0294  REF  2  LAST  421     33,2416   00051 0                S2
0295                        33,2417   0 0006 1  EARTHR* EXTEND
02951 REF  3  LAST   32     33,2420   23'426 0         QXCH  QPLACES
02952 REF  19  LAST  417    33,2421   0 6006 1         TC    INTPRET
02953                       33,2422    77624 1         CALL
02954 REF  1                33,2423    66370 0               EARTHR
02955                       33,2424    77776 1  PROUT  EXIT
02956 REF  4  LAST  415     33,2425   0 2316 1         TC    IMUSTLLG
02957 REF  4  LAST  421     33,2426   0 1426 0         TC    QPLACES
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0296                                33,2427  0 0006 1  SHOW     EXTEND
0297  REF  11  LAST  420  33,2430  23'425 0            QXCH     QPLACE
0298  REF   5  LAST  417  33,2431  3 1423 0  SHOW1     CA       POSITCN
0299  REF  12  LAST  418  33,2432  55'052 0            TS       DSPTEM2 +2
0300  REF   1             33,2433  3 2442 1            CA       VB06N98
0301  REF  65  LAST  419  33,2434  0 4555 0            TC       BANKCALL
0302  REF   3  LAST  389  33,2435   20624 0            CADR     GOFLASH
0304  REF   1             33,2436  0 2267 0            TC       ENDTEST1        V 34
0305  REF  12  LAST  422  33,2437  0 1425 0            TC       QPLACE           V33
0306  REF   1             33,2440  1 2431 1            TCF      SHOW1


03061                               33,2441   14400 0  OC14400  OCT      14400
0307  REF   2  LAST  421  33,2447                      3990DEC  =        OMEG/MS
0308                                33,2442   01542 0  VB06N98  VN       0698
0309                                33,2443   01602 1  TESTTIME OCT      01602
0310  REF   5  LAST  357     4375                      DEC17    =        ND1
0311  REF   9  LAST  275  33,2444   02757 0  OGCPL    ECADR    OGC
0312  REF   1                4734                    1SECX    =        1SEC
0313  REF  15  LAST  366     4374                      DEC57    =        VD1
0314  REF   3  LAST  419  33,2445   01713 0  XNBADR   GENADR   XNB
0315  REF  21  LAST  421  33,2446   01671 0  XSMADR   GENADR   XSM
0316                                33,2447   07623 1  OMEG/MS  2DEC     .24339048
0316                                33,2450   26552 1


03161 REF  66  LAST  422  33,2451  0 4555 0  P11OUT   TC       BANKCALL
03162 REF   2  LAST  206  33,2452   70127 1            CADR     MATRXJOB        RETURN TO P11

03165 REF   1                                         COUNT    02/CDMST


0317                                 4526                     BLOCK    2
0318                                 4526  0 0004 0  FINETIME INHINT                  RETURNS WITH INTERRUPT INHIBITED
0319                                 4527  0 0006 1            EXTEND
0320  REF   1                       4530  00 004 0            READ     LOSCALAR
0321  REF  52  LAST  420            4531  54 001 1            TS       L
0322                                 4532  0 0006 1            EXTEND
0323  REF   2  LAST  422            4533  06 004 0            RXOR     LOSCALAR
0324                                 4534  0 0006 1            EXTEND
0325                                 4535  1 4541 1            BZF      +4
0326                                 4536  0 0006 1            EXTEND
0327  REF   3  LAST  422            4537  00 004 0            READ     LOSCALAR
0328  REF  53  LAST  422            4540  54 001 1            TS       L
0329  REF  11  LAST  417            4541  4 4672 1  +4        CS       POSMAX
0330  REF  54  LAST  422            4542  6 0001 0            AD       L
0331                                 4543  0 0006 1            EXTEND
0332  REF   2  LAST  419            4544  1 4527 1            BZF      FINETIME +1
0333                                 4545  0 0006 1            EXTEND
0334  REF   1                       4546  00 003 1            READ     HISCALAR
0335  REF 147  LAST  420            4547  0 0002 0            TC       Q
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R0336   PROGRAM NAME-OPTIMUM PRELAUNCH ALIGNMENT CALIBRATION
R0337   DATE- NOVEMBER 2  1966
R0338   BY- GEORGE SCHMIDT IL 7-146 EXT. 126
R0339   MOD NO 3
R0340   FUNCTIONAL DESCRIPTION

R0341   THIS     SECTION CONSISTS OF PRELAUNCH ALIGNMENT AND GYRO DRIFT TESTS
R0342   INTEGRATED TOGETHER TO SAVE WORDS. COMPASS IS COMPLETELY RESTART
R0343   PROOFED EXCEPT FOR THE FIRST 30 SECONDS OR SO.  PERFORMANCE TESTS OF
R0344   THE IRIGS IS RESTART PROOFED ENOUGH TO GIVE 75 PERCENT CONFIDENCE THAT
R0345   IF A RESTART OCCURS THE DATA WILL STILL BE GOOD. GOOD PRACTICE TO RECYCL
R0346   WHEN A RESTART OCCURS UNLESS IT HAPPENS NEAR THE END OF A TEST-THEN WAIT
R0347   FOR THE DATA TO FLASH.
R0347A  A RESTART IN GYROCOMPASS DURING GYRO TORQUING CAUSES PULSES TO BE LOST
R0348   THE PRELAUNCH ALIGNMENT TECHNIQUE IS BASICALLY THE SAME AS IN BLOCK I
R0349   EXCEPT THAT IT HAS BEEN SIMPLIFIED IN THE SENSE THAT SMALL ANGLE APPROX.
R0350   HAVE BEEN USED. THE DRIFT TESTS USE A UNIQUE IMPLEMENTATION OF THE
R0351   OPTIMUM STATISTICAL FILTER. FOR A DESCRIPTION SEE E-1973.BOTH OF THESE
R0352   ROUTINES USE STANDARD SYSTEM TEST LEADIN PROCEDURES. THE INITIALIZATION
R0353   PROCEDURE FOR THE DRIFT TESTS IS IN THE JOC S. THE INITIALIZATION METHOD
R0354   FOR GYROCOMPASS IS AN ERAS LOAD THEN A MISSION PHASE CALL.
R0355   THE COMPASS ALIGNS TO Z DOWN,X DOWNRANGE, HAS THE CAPABILITY
R0356   CHANGE AZIMUTH WHILE RUNNING , IS COMPENSATED FOR
R0357   COMPONENT ERRORS,IS CAPABLE OF OPTICAL VERIFICATION( CSM ONLY).

R0358   COMPASS ERASABLE LOAD REQUIRED

R0359    1-LAUNCHAZ -DP AZIMUTH IN REV FROM NORTH OF XSM DESIRED      (NORM=.2)
R0360   2- LATITUDE -DP-OF LAUNCH PAD
R0361   3- AZIMUTH-DP-OF 2ND OF VEHICLE
R0361A  4- IMU COMPENSATION PARAMETERS
R0362   5-AZ AND ELEVATION OF TARGETS 1,2      ****OPTIONAL****

R0363   TO PERFORM AS PART OF COMPASS

R0364   1-OPTICAL VERIFICATION- V 65 E
R0365   2-AZIMUTH CHANGE-V 78 E

R0366   SUBROUTINES CALLED

R0367   DURING OPTICAL VERIFICATION (CSM ONLY) ESSENTIALLY ALL OF INFLIGHT ALIGN
R0368   IS CALLED IN ONE WAY OR ANOTHER. SEE THE LISTING.

R0369   NORMAL EXIT

R0370   DRIFT TESTS- LENGTHCT GOES TO ZERO-RETURN TO IMU PERF TEST2 CONTROL
R0371   GYROCOMPASS-MANY,SEE THE LISTING
R0372   ALARMS

R0373   1600     OVERFLOW IN DRIFT TEST
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L IMU CALIBRATION AND ALIGNMENT USER'S PAGE NO. 11 E5 S3

R0374 1601 BAD IMU TORQUE ABORT
R0375 1602 BAD OPTICS DURING VERIFICATION-RETURN TO COMPASS CSM ONLY

R0376 OUTPUT

R0377 DRIFT TESTS- FLASHING DISPLAYS OF RESULTS-CONTROLLED IN IMU PERF TESTS 2
R0378 COMPASS-PROGRAM MODE LIGHTS TELL YOU WHAT PHASE OF PROGRAM YOU ARE IN
R0379 01 INITIALIZING THE PLATFORM POSITION AND ERASABLE
R0380 02 GYROCOMPASSING
R0381 03 DOING OPTICAL VERIFICATION (CSM)
R0382
R0383
R0384 DEBRIS

R0385 ALL CENTRALS,ALL OF EBANK XSM

R0386 MOST OF THE ROUTINES COMMON TO ALIGNMENT AND CALIBRATION APPEAR
R0387 ON THE NEXT FEW PAGES.

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03875  REF   1                                          COUNT  33/P02

0388   REF  22  LAST  422   E5,1671                     EBANK= XSM
0389                        33,2453                     BANK   33
0390   REF   3  LAST  421   33,2000                     SETLOC IMUCAL
0391                        33,2453                     BANK

0392   REF   2  LAST  252   33,2453  0 5261 1  ESTIMS   TC     2PHSCHNG        COMES HERE FROM IMU2
0393                        33,2454   00075 C            OCT    00075
03931                       33,2455   00004 C            OCT    00004           TURN OFF GROUP 4 IF ON
0394                        33,2456  0 0004 C  RSTGTS1   INHINT                 COMES HERE PHASE1 RESTART
0395   REF   7  LAST  407   33,2457  3 0025 C            CA     TIME1
0396   REF   1              33,2460  55*645 C            TS     GTSWTLT1
0397   REF  96  LAST  420   33,2461  3 4714 1            CAF    ZERO            ZERO THE PIPAS
0398   REF   6  LAST  419   33,2462  54 037 1            TS     PIPAX
0399   REF   1              33,2463  54 040 1            TS     PIPAY
0400   REF   1              33,2464  54 041 C            TS     PIPAZ
0402                        33,2465  0 0003 1            RELINT
0403   REF   1              33,2466  3 3131 1            CA     77DECML         ZERO ALL NECESSARY LOCATIONS
0404   REF   4  LAST  420   33,2467  55*655 1            TS     ZERONDX1
0405   REF   1              33,2470  3 3132 1            CA     ALXXXZ
0406   REF   2  LAST  415   33,2471  0 2356 C            TC     ZEROING
0407   REF  20  LAST  421   33,2472  0 6006 1            TC     INTPRET
04084                       33,2473   77735 C            SLOAD
04085  REF   3  LAST  421   33,2474   27113 1                   SCHZEROS
04086  REF   9  LAST  299   33,2475   25477 1            STOVL  GCOMPSW -1
0409   REF   1              33,2476   27124 C                   INTVAL +2       LOAD SOME INITIAL DRIFT GAINS
0410   REF   1              33,2477   26455 1            STOVL  ALX1S
0411   REF   4  LAST  425   33,2500   27113 1                   SCHZEROS
0412   REF  17  LAST  299   33,2501   01472 1            STORE  GCOMP
0413   REF   6  LAST  292   33,2502   01163 1            STORE  DELVX           GCOMPZER SUBROUTINE NO LONGER NEEDED
0414                        33,2503   77776 1            EXIT

0415   REF   2  LAST  414   33,2504  11*643 C            CCS    GEOCCMP1        NON ZERO IF COMPASS.
0416                        33,2505  0 2507 1            TC     +2
0417   REF   1              33,2506  0 2523 1            TC     SLEEPIE +1
0422   REF  21  LAST  425   33,2507  0 6006 1            TC     INTPRET
04221                       33,2510   77624 1            CALL
04222  REF   1              33,2511   64000 C                   ERTHRVSE
04223                       33,2512   77776 1            EXIT
0423   REF   7  LAST  417   33,2513  3 1412 1            CA     LENGTHOT         TIMES FIVE IS THE NUM OF SEC ERECTING
0424   REF   1              33,2514  55*646 C            TS     ERECTIME

0425   REF   3  LAST  418   33,2515  0 5243 1            TC     NEWMODEX
0426                        33,2516   00002 C            MM     02
0427   REF  67  LAST  422   33,2517  0 4555 C            TC     BANKCALL        SET UP PIPA FAIL TO CAUSE ISS ALARM
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L INL CALIBRATION AND ALIGNMENT USER'S PAGE NO. 13 E5 S3

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0428   REF   2  LAST  299   33,2520   17075 0        CADR   PIPUSE      COMPASS NEVER TURNS THIS OFF
0429   REF   1              33,2521   0 3377 1       TC     ANNNNNN     END OF FIRST TIME THROUGH
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R0430    COMES HERE AT THE END OF EVERY ITERATION THROUGH DRIFT TEST OR COMPASS

R0431    SET UP WAITLIST SECTION
 0432  REF   8  LAST  425   33,2522  55'412 C  SLEEPIE  TS      LENGTHOT        TEST NOT OVER-DECREMENT LENGTHOT
 0433  REF   7  LAST  383   33,2523  0 5301 C            TC      PHASCHNG         CHANGE PHASE
 0434                       33,2524   00135 C            OCT     00135
 0435  REF   5  LAST  417   33,2525  11'450 C            CCS     TORQADX         ARE WE DOING VERTORIFT
 0436  REF   4  LAST  417   33,2526  0 2417 1            TC      EARTHR*         TRUE TORQUE SOUTH GYRO
 0437  REF   1             33,2527  0 3402 1  WTLISTNT  TC      CHKCOMED              SEE IF COMPASS OVER
 04371 REF   1             33,2530  0 2532 1            TC      SETGWLST
 04372 REF  54  LAST  416  33,2531  0 5112 C            TC      ENDOFJOB

 04373                     33,2532  0 0006 1  SETGWLST  EXTEND
 04374 REF 218  LAST  396  33,2533  22 154 1            QXCH    MPAC             CALLED EVERY WAITLIST OR AZIMUTH CHANGE
 0438                      33,2534  0 0004 0            INHINT
 0439  REF   8  LAST  425  33,2535  4 0025 1            CS      TIME1
 0440  REF   2  LAST  425  33,2536  6 1645 1            AD      GTSWTLT1
 0441                      33,2537  0 0006 1            EXTEND
 0442                      33,2540  6 2542 C            BZMF    +2
 0443  REF   2  LAST  407  33,2541  6 4674 C            AD      NEGMAX           10 MS ERROR OK
 0444  REF   2  LAST  414  33,2542  6 1644 C            AD      1SECXT1          1 SEC FOR CALIBRATION, .5 SEC IN COMPASS
 0445                      33,2543  0 0006 1            EXTEND
 0446  REF   1             33,2544  6 2550 C            BZMF    RIGHTGTS
 0447  REF   3  LAST  416  33,2545  0 5130 0  WTGTSMPL  TC      TWIDDLE
 0448  REF   1             E5,1540                     EBANK=  ALTIM
 0449  REF   1             33,2546   02575 1           ADRES   ALLOCP
 0451  REF 219  LAST  427  33,2547  0 0154 1            TC      MPAC
 0452  REF   7  LAST  353  33,2550  3 4710 C  RIGHTGTS  CAF     FOUR             SET UP NEXT WAITLIST-ALLOW SOME TIME
 0453  REF   1             33,2551  0 2545 1            TC      WTGTSMPL         END OF WAITLIST SECTION

R0454    STORE AND LOAD DATA SECTIONS FOR RESTART PROOFING

 0455                      33,2552   00031 C  25DECML   DEC     25

 0456  REF   1             33,2553  3 2552 1  STOREDTA  CAF     25DECML
 0457  REF 220  LAST  427  33,2554  54 154 C            TS      MPAC
 0458  REF 221  LAST  427  33,2555  50 154 1            INDEX   MPAC
 0459  REF   2  LAST   97  33,2556  31'460 1            CAE     THETAX1
 0460  REF 222  LAST  427  33,2557  50 154 1            INDEX   MPAC
 0461  REF   1             33,2560  55'577 1            TS      RESTARPT
 0462  REF 223  LAST  427  33,2561  10 154 C            CCS     MPAC
 0463  REF   1             33,2562  1 2554 C            TCF     STOREDTA +1
 0464  REF 148  LAST  422  33,2563  0 0002 C            TC      Q

 0465  REF   2  LAST  427  33,2564  3 2552 1  LOADSTDT  CAF     25DECML
 0466  REF 224  LAST  427  33,2565  54 154 C            TS      MPAC
 0467  REF 225  LAST  427  33,2566  50 154 1            INDEX   MPAC
 0468  REF   2  LAST  427  33,2567  3 1577 C            CA      RESTARPT
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0469    REF 226  LAST  427   33,2570  50 154 1          INDEX  MPAC
0470    REF   3  LAST  427   33,2571  55'460 0          TS     THETAX1
0471    REF 227  LAST  428   33,2572  10 154 0          CCS    MPAC
0472    REF   1              33,2573  1 2565 1          TCF    LOADSTOT +1
0473    REF 149  LAST  427   33,2574  0 0002 0          TC     Q

R0474    COMES HERE EVERY ITERATION BY A WAITLIST CALL SET IN SLEEPIE

0475    REF   9  LAST  427   33,2575  3 0025 0  ALLOOP  CA     TIME1
0476    REF   3  LAST  427   33,2576  55'645 0          TS     GTSWTLT1      STORE TIME TO SET UP NEXT WAITLIST.
0477    REF   2  LAST  427   33,2577  3 1540 1  ALLOOP3 CA     ALTIM
0478    REF   1              33,2600  55'631 0          TS     GEOSAVE1
0479    REF   8  LAST  427   33,2601  0 5301 0          TC     PHASCHNG
0480                         33,2602   00115 1          OCT    00115
0481    REF   2  LAST  428   33,2603  31'631 1  ALLOOP1 CAE    GEOSAVE1
0482    REF   3  LAST  428   33,2604  55'540 0          TS     ALTIM
0483    REF 128  LAST  407   33,2605  10 000 0          CCS    A
0484    REF 129  LAST  428   33,2606  3 0000 1          CA     A             SHOULD NEVER HIT THIS LOCATION
0485    REF   1              33,2607  55'541 1          TS     ALTIMS
0486    REF 130  LAST  428   33,2610  4 0000 0          CS     A
0487    REF   4  LAST  428   33,2611  55'540 0          TS     ALTIM
0488    REF   7  LAST  425   33,2612  3 0037 0          CA     PIPAX
0489    REF   7  LAST  425   33,2613  55'162 1          TS     DELVX
0490    REF   2  LAST  425   33,2614  3 0040 0          CA     PIPAY
0491    REF   4  LAST  292   33,2615  55'164 1          TS     DELVY
0492    REF   2  LAST  425   33,2616  3 0041 1          CA     PIPAZ
0493    REF   3  LAST  293   33,2617  55'166 0          TS     DELVZ
0494    REF   1              33,2620  3 4374 0          CAF    19DECML       23 OCT
0495    REF   1              33,2621  0 4114 1          TC     NEWPHASE
0496                         33,2622   00005 1          OCT    00005
0497    REF  97  LAST  425   33,2623  3 4714 1  SPECSTS CAF    ZERO
0498    REF   8  LAST  428   33,2624  54 037 1          TS     PIPAX
0499    REF   3  LAST  428   33,2625  54 040 1          TS     PIPAY
0500    REF   3  LAST  428   33,2626  54 041 0          TS     PIPAZ
0501    REF   3  LAST  416   33,2627  3 4675 1          CAF    PRIO20
0502    REF  16  LAST  416   33,2630  0 5042 1          TC     FINDVAC
0503    REF   3  LAST  428   E5,1631                    EBANK= GEOSAVE1
0504    REF   1              33,2631   02634 1          2CADR  ALFLT         START THE JOB
0504    REF   1              33,2632   66065 1
0505    REF  20  LAST  416   33,2633  0 5213 1          TC     TASKOVER
```

L IMU CALIBRATION AND ALIGNMENT USER'S PAGE NO. 16 E5 53

R0506 THIS IS PART OF THE JOB DONE EVERY ITERATION

```
0507  REF   2  LAST  427   33,2634  0 2553 0  ALFLT   TC      STOREDTA      STORE DATA IN CASE OF RESTART IN JOB
0508  REF   9  LAST  428   33,2635  0 5301 0          TC      PHASCHNG      THIS IS THE JOB DONE EVERY ITERATION
0509                       33,2636   00215 1          OCT     00215
0510                       33,2637  1 2641 1          TCF     +2
0511  REF   2  LAST  428   33,2640  0 2564 1  ALFLT1  TC      LOADSTDT      COMES HERE ON RESTART

0512  REF   3  LAST  425   33,2641  11'643 0          CCS     GEOCCMP1
0513                       33,2642  0 2644 0          TC      +2
0514  REF   1              33,2643  0 2647 0          TC      NORMLOP
0515  REF   2  LAST  427   33,2644  0 3402 1          TC      CHKCCMED      SEE IF PRELAUNCH OVER
0516  REF  68  LAST  425   33,2645  0 4555 0          TC      BANKCALL      COMPENSATION IF IN COMPASS
0517  REF   1              33,2646   15262 0          CADR    1/PIPA

0518  REF  22  LAST  425   33,2647  0 6006 1  NORMLOP  TC      INTPRET
0519                       33,2650   77745 1          DLOAD
0520  REF   2  LAST  425   33,2651   27122 0                   INTVAL
0521  REF   5  LAST  401   33,2652   24051 0          STOVL   S1
0522  REF   8  LAST  428   33,2653   01163 1                   DELVX
0523                       33,2654   76505 0          VXM     VSL1
0524  REF  23  LAST  425   33,2655   02672 0                   XSM
0525                       33,2656   57545 1          DLOAD   DCOMP
0526  REF 228  LAST  428   33,2657   00160 0                   MPAC +3
0527  REF   1              33,2660   16533 0          STODL   DPIPAY
0528  REF 229  LAST  429   33,2661   00162 1                   MPAC +5
0529  REF   1              33,2662   02537 1          STORE   DPIPAZ

0530                       33,2663   76001 1          SETPD   AXT,1
0531                       33,2664   00001 0                  0
0532                       33,2665   00010 0                  8D
0533                       33,2666   57535 0          SLOAD   DCOMP
0534  REF   4  LAST  429   33,2667   02644 0                   GEOCCMP1
0535                       33,2670   77640 0          BMN
0536  REF   1              33,2671   67204 0                   ALWAYSG       DO A QUICK COMPASS
```

L IMU CALIBRATION AND ALIGNMENT USER'S PAGE NO. 17 E5 S3

R0537 NOW WE HAVE JUST THE CALIBRATION PARTS OF THE PROGRAM-NEXT PAGES

05375 REF 2 LAST 413 TO 422: 314 314* COUNT 33/CONST

0538				33,2672	50135	C	ALCGKK	SLOAD	BMN
0539	REF	2	LAST 428	33,2673	02542	C			ALTIMS
0540	REF	1		33,2674	66707	1			ALFLT3
0541				33,2675	72174	C	ALKCG	AXT,2	LXA,1
0542				33,2676	00014	1			12D
0543	REF	2	LAST 425	33,2677	02454	C			ALX1S
0544				33,2700	62143	C	ALKCG2	DLOAD*	INCR,1
0545	REF	1		33,2701	02243	C			ALFDK +144D,1
0546				33,2702	77775	1		DEC	-2
0547	REF	1		33,2703	12555	1		STORE	ALDK +10D,2
0548				33,2704	66104	1		TIX,2	SXA,1
0549	REF	1		33,2705	66700	C			ALKCG2
0550	REF	3	LAST 430	33,2706	02454	C			ALX1S
0551				33,2707	77770	1	ALFLT3	AXT,1	
0552				33,2710	00010	C			8D
0553				33,2711	41343	C	DELMLP	DLOAD*	DMP
0554	REF	2	LAST 429	33,2712	02543	1			DPIPAY +8D,1
0555	REF	1		33,2713	27676	C			PIPASC
0556				33,2714	43661	1		SLR	BDSU*
0557				33,2715	21212	C			9D
0558	REF	1		33,2716	02511	C			INTY +8D,1
0559	REF	2	LAST 430	33,2717	06511	1		STORE	INTY +8D,1
0560				33,2720	40725	C		PDDL	DMP*
0561	REF	1		33,2721	27700	C			VELSC
0562	REF	1		33,2722	02531	1			VLAUN +8D,1
0563				33,2723	77732	1		SL2R	
0564				33,2724	45425	C		DSU	STADR
0565	REF	1		33,2725	71206	C		STORE	DELM +8D,1
0566	REF	2	LAST 430	33,2726	06573	C		STORE	DELM +10D,1
0567				33,2727	77100	C		TIX,1	AXT,2
0568	REF	1		33,2730	66711	C			DELMLP
0569				33,2731	00004	C			4
0570				33,2732	56743	1	ALILP	DLOAD*	DMPR*
0571	REF	3	LAST 97	33,2733	75314	C			ALK +4,2
0572	REF	2	LAST 430	33,2734	75230	1			ALDK +4,2
0573	REF	4	LAST 430	33,2735	12463	C		STORE	ALK +4,2
0574				33,2736	77104	1		TIX,2	AXT,2
0575	REF	1		33,2737	66732	1			ALILP
0576				33,2740	00010	C			8D
0577				33,2741	66140	1	ALKLP	LXC,1	SXA,1
0578	REF	1		33,2742	02455	1			CMPX1
0579	REF	2	LAST 430	33,2743	02455	1			CMPX1
0580				33,2744	56743	1		DLOAD*	DMPR*
0581	REF	5	LAST 430	33,2745	02460	1			ALK +1,1
0582	REF	3	LAST 430	33,2746	75206	1			DELM +8D,2

NO NEW GAINS NEEDED
LOADS SLOPES AND TIME CONSTANTS AT RQST

MEASUREMENT INCORPORATION ROUTINES
AND GAIN UPDATES

```
0583                                33,2747   77613 C            DAD*
0584  REF   3  LAST  43C             33,2750   75266 1                 INTY +8D,2
0585  REF   4  LAST  431             33,2751   12511 1            STORE INTY +8D,2
0586                                33,2752   42743 1            DLOAD* DAD*
0587  REF   6  LAST  43C             33,2753   75304 1                 ALK +12D,2
0588  REF   3  LAST  43C             33,2754   75220 C                 ALDK +12D,2
0589  REF   7  LAST  431             33,2755   12473 1            STORE ALK +12D,2
0590                                33,2756   42673 C            DMPR* DAD*
0591  REF   4  LAST  43C             33,2757   75206 1                 DELM +8D,2
0592  REF   5  LAST  431             33,2760   75256 1                 INTY +16D,2
0593  REF   6  LAST  431             33,2761   12521 1            STORE INTY +16D,2
0594                                33,2762   40743 C            DLOAD* DMP*
0595  REF   1                       33,2763   27703 C                 ALSK +1,1
0596  REF   5  LAST  431             33,2764   75206 1                 DELM +8D,2
0597                                33,2765   42772 C            SL1R   DAD*
0598  REF   2  LAST  43C             33,2766   75246 C                 VLAUN +8D,2
0599  REF   3  LAST  431             33,2767   12531 C            STORE  VLAUN +8D,2
0600                                33,2770   76104 C            TIX,2  AXT,1
0601  REF   1                       33,2771   66741 C                 ALKLP
0602                                33,2772   00010 0                 8D


0603                                33,2773   64743 C  LOOSE     DLOAD* PDDL*          EXTRAPOLATE SWAY VARIABLES
0604  REF   1                       33,2774   02533 C                 ACCWD +8D,1
0605  REF   4  LAST  431             33,2775   02531 1                 VLAUN +8D,1
0606                                33,2776   55523 C            PDDL*  VDEF
0607  REF   1                       33,2777   02541 C                 POSNV +8D,1
0608                                33,3000   76521 C            MXV    VSL1
0609  REF   2  LAST   89            33,3001   02001 1                 TRANSM1
0610                                33,3002   77745 1            DLOAD
0611  REF 23C  LAST  429            33,3003   00155 C                 MPAC
0612  REF   2  LAST  431             33,3004   06541 1            STORE  POSNV +8D,1
0613                                33,3005   77745 1            DLOAD
0614  REF 231  LAST  431             33,3006   00160 C                 MPAC +3
0615  REF   5  LAST  431             33,3007   06531 C            STORE  VLAUN +8D,1
0616                                33,3010   77745 1            DLOAD
0617  REF 232  LAST  431             33,3011   00162 1                 MPAC +5
0618  REF   2  LAST  431             33,3012   06533 1            STORE  ACCWD +8D,1
0619                                33,3013   77700 C            TIX,1
0620  REF   1                       33,3014   66773 1                 LOOSE


0621                                33,3015   76174 1            AXT,2  AXT,1          EVALUATE SINES AND COSINES
0622                                33,3016   00006 1                 6
0623                                33,3017   00002 C                 2
0624                                33,3020   57343 1  BOOP      DLOAD* DMPR
0625  REF   1                       33,3021   02513 1                 ANGX +2,1
0626  REF   1                       33,3022   27706 C                 GEORGEJ
0627                                33,3023   77722 C            SR2R
0628                                33,3024   73406 1            PUSH   SIN
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0629                                33,3025   56072 1          SL3R    XAD,1
0630   REF   1                     33,3026   00046 C                  X1
0631                                33,3027   10021 C          STORE   16D,2
0632                                33,3030   77745 1          DLOAD
0633                                33,3031   77746 1          COS
0634                                33,3032   10027 C          STORE   22D,2          COSINES
0635                                33,3033   77704 1          TIX,2
0636   REF   1                     33,3034   67020 1                  BOOP
0637                                33,3035   77776 1  PERFERAS EXIT
0638   REF   2  LAST  251          33,3036   3 4753 1         CA      EBANK7
0639   REF   5  LAST  273          E7,1400                    EBANK=  LAT(SPL)
06395  REF  18  LAST  37C          33,3037   54 003 C         TS      EBANK
0640   REF   6  LAST  432          33,3040   0 1400 1         TC      LAT(SPL)       GO TO ERASABLE ONLY TO RETURN

R0641              CAUTION

R0642  THE ERASABLE PROGRAM THAT DOES THE CALCULATIONS MUST BE LOADED
R0643  BEFORE ANY ATTEMPT IS MADE TO RUN THE IMU PERFORMANCE TEST

0734   REF   9  LAST  427          E5,1412                    EBANK=  LENGTHOT
0735   REF  10  LAST  432          33,3041   11'412 C ONCEMORE CCS     LENGTHOT
0736   REF   2  LAST  425          33,3042   0 2522 C         TC      SLEEPIE        TEST NOT OVER SET UP NEXT WAITLIST

07361  REF   6  LAST  427          33,3043   11'450 C         CCS     TORQNDX
07362                               33,3044   1 3046 1         TCF     +2
07363  REF   1                     33,3045   0 3050 1         TC      SETUPER1
07364  REF   9  LAST  417          33,3046   3 0032 C         CA      CDUX
07365  REF   3  LAST  417          33,3047   55'414 C         TS      LOSVEC +1      FOR TROUBLESHOOTING POSNS 2$4 VD
0737   REF  23  LAST  429          33,3050   0 6006 1 SETUPER1 TC     INTPRET        DRIFT TEST OVER
0738                                33,3051    65345 C         DLOAD   PDDL           ANGLES FROM DRIFT TEST ONLY
0739   REF   1                     33,3052    02503 C                 ANGZ
0740   REF   1                     33,3053    02507 1                 ANGY
0741                                33,3054    55525 C         PDDL    VDEF
0742   REF   2  LAST  431          33,3055    02511 C                 ANGX
0743                                33,3056    74276 1         VCOMP   VXSC
0744   REF   2  LAST  431          33,3057    27706 C                 GEORGEJ
0745                                33,3060    74521 1         MXV     VSR1
0746   REF  24  LAST  429          33,3061    02672 C                 XSM
0747   REF  10  LAST  422          33,3062    02760 1         STORE   OGC
0748                                33,3063    77776 1         EXIT

0749   REF  10  LAST  429          33,3064   0 5301 C TORQINCH TC     PHASCHNG
0750                                33,3065    00005 1         OCT     00005
0751   REF   1                     33,3066   3 2444 1         CA      OGCPL
0752   REF  69  LAST  429          33,3067   0 4555 C         TC      BANKCALL
0753   REF   3  LAST  296          33,3070    17125 1         CADR    IMUPULSE
0754   REF   5  LAST  421          33,3071   0 2316 1         TC      IMUSTLLG
0755   REF   7  LAST  432          33,3072   11'450 C         CCS     TORQNDX        + IF IN VERTICAL DRIFT TEST
0756   REF   1                     33,3073   0 2262 C         TC      VALMIS         VERT DRIFT TEST OVER
0757   REF  24  LAST  432          33,3074   0 6006 1         TC      INTPRET
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07571                          33,3075   77624 1          CALL                    SET UP ERATE FOR PIP TEST OR COMPASS
07572  REF   2  LAST  425      33,3076   64000 0                   ERTHRVSE
07573                          33,3077   77776 1          EXIT
0758   REF   1                33,3100   0 2122 1         TC      TORQUE          GO TO IMU2 FOR A PIPA TEST AND DISPLAY

0759   REF  21  LAST  250      33,3101   0 5537 0 SOMEERRR TC     ALARM
0760                           33,3102    01600 0         OCT     1600
0761                           33,3103   0 3106 0         TC      +3
0762   REF  22  LAST  433      33,3104   0 5537 0 SOMERR2  TC     ALARM
0763                           33,3105    01601 1         OCT     1601
0764   REF  11  LAST  432      33,3106   0 5301 0         TC      PHASCHNG
0765                           33,3107    00005 1         OCT     00005
0766   REF   2  LAST  422      33,3110   0 2267 0         TC      ENDTEST1

R0767   THE FAMOUS MAGIC NUMBERS OF SCHMIDT ARE NOW PART OF AN ERASABLE LOAD.

0768                           33,3111    02222 1 DEC585   OCT     02222           1170 B+14  ORDER IS NOW IMPORTANT
0769                           33,3112    00000 1 SCHZEROS 2DEC    .00000000
0769                           33,3113    00000 1
0770                           33,3114    00000 1          2DEC    .00000000
0770                           33,3115    00000 1
0771                           33,3116    00000 1          OCT     00000
0772                           33,3117    00000 1 ONEDPP   OCT     00000
0773                           33,3120    00001 0          OCT     00001                   ABOVE ORDER IS IMPORTANT

0774                           33,3121    00004 0 INTVAL   OCT     4
0775                           33,3122    00002 0          OCT     2
0776                           33,3123    00220 1          DEC     144
0777                           33,3124    77776 1          DEC     -1
0778                           33,3125    35730 0 SCUPLY   2DEC    .93505870       INITIAL GAINS FOR PIP OUTPUTS
0778                           33,3126    00035 1
0779                           33,3127    10317 0          2DEC    .26266423       INITIAL GAINS/4 FOR ERECTION ANGLES
0779                           33,3130    17550 1

0780                           33,3131    00115 1 77DECML  DEC     77
0781   REF   4  LAST  430      33,3132    01453 1 ALXXXZ   GENADR  ALXIS -1
R0789   GYROCOMPASS PORTIONS FINISH THIS LOG SECTION

07895  REF   1                                             COUNT   33/PC1

R0790   INITIALIZATION SECTION

0791   REF  56  LAST  416      33,3133   3 4712 1 GTSCPSS  CAF     ONE             CALLED BY V37.
0792   REF   5  LAST  429      33,3134   55'643 0         TS      GEOCCMP1        THIS IS THE LEAD IN FOR COMPASS.
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0793   REF   1                33,3135  3 3425 1          CA      1/PIPAGT
0794   REF   8  LAST  414     33,3136  55'074 1          TS      1/PIPADT
0795   REF  21  LAST  296     33,3137  3 4703 1  NXX1BNN CA      BIT8
0796   REF  11  LAST  432     33,3140  55'412 0          TS      LENGTHOT
0797   REF   1                33,3141  3 4731 0          CAF     1/2SECX        COMPASS IS A .5 SEC LOOP
0798   REF   3  LAST  427     33,3142  55'644 1          TS      1SECXT1
0799   REF  57  LAST  433     33,3143  3 4712 1          CAF     ONE
0800   REF   1                33,3144  55'632 0          TS      PREMTRX1
08005  REF   2  LAST  415     33,3145  55'657 0          TS      PERFDLAY +1
08006  REF  98  LAST  428     33,3146  3 4714 1          CAF     ZERO
08007  REF   3  LAST  434     33,3147  55'656 1          TS      PERFDLAY
0801                           33,3150  0 0006 1          EXTEND
0802   REF   4  LAST   97     33,3151  3 1634 1          DCA     LUNCHAZ1
0803   REF   1                33,3152  53'636 1          DXCH    NEWAZ1
08031                          33,3153  0 0006 1          EXTEND
08032  REF   5  LAST  434     33,3154  3 1634 1          DCA     LUNCHAZ1
08033  REF   1                33,3155  53'640 0          DXCH    OLDAZMTH
0804   REF   2  LAST  414     33,3156  3 4375 1  SETUPGC CA      DEC17
0805   REF   5  LAST  425     33,3157  55'655 1          TS      ZERONDX1
0806   REF   1                33,3160  3 2446 0          CA      XSMADR
0807   REF   3  LAST  425     33,3161  0 2356 0          TC      ZEROING
0808   REF   1                33,3162  0 3164 1          TC      POSN17C
0809   REF   1                33,3163  0 2030 0          TC      GEOIMUTT       GO TO IMU2 FOR FURTHER INITIALIZATION

0810                           33,3164  0 0006 1  POSN17C EXTEND                  COMPASS POSITION Z DOWN,X DOWNRANGE
0811   REF  13  LAST  422      33,3165  23'425 0          QXCH    QPLACE         FROM NORTH IN REVOLUTIONS + CLOCKWSE
0812   REF   2  LAST  419     33,3166  4 4675 0          CS      HALF           ALL THIS TO INITIALIZE MATRIX
0813   REF   2  LAST   92     33,3167  55'705 0          TS      ZSM
0814   REF  25  LAST  432     33,3170  0 6006 1          TC      INTPRET
0815                           33,3171   41545 0          DLOAD   PUSH
0816   REF   2  LAST  434     33,3172   02636 0                  NEWAZ1
0817                           33,3173   77756 0          SIN
0818   REF  25  LAST  432     33,3174   02676 1          STORE   XSM +4
0819   REF   2  LAST   92     33,3175   16702 0          STODL   YSM +2
0820                           33,3176   77746 1          COS
0821   REF   3  LAST  434     33,3177   02704 0          STORE   YSM +4
0822                           33,3200   77676 0          DCOMP
0823   REF  26  LAST  434     33,3201   02674 0          STORE   XSM +2
0824                           33,3202   77776 1          EXIT
0825   REF  14  LAST  434     33,3203  0 1425 0          TC      QPLACE

R0826   JOB DONE EVERY ITERATION THROUGH COMPASS PROGRAM.SET BY TASK ALLOOP

08268  REF   2 LAST  425 TC  430:   143   143*           COUNT   33/PD2

0827                           33,3204   44743 1  ALWAYSG DLOAD* DSU*            COMPASS AND ERECT
0828   REF   3  LAST  430     33,3205   02543 1                 DPIPAY +8D,1
0829   REF   2  LAST   97     33,3206   02505 0                 FILDELV1 +8D,1
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0830                                33,3207  42675 C          DMPR    DAD*
0831  REF   1                      33,3210  27714 C                  GEOCCNS1
0832  REF   3  LAST  434           33,3211  02505 C                  FILDELV1 +8D,1
0833  REF   4  LAST  435           33,3212  06505 1          STORE   FILDELV1 +8D,1
0834                                33,3213  77613 C          DAD*
0835  REF   1                      33,3214  02507 1                  INTVEC1 +8D,1
0836  REF   2  LAST  435           33,3215  06507 C          STORE   INTVEC1 +8D,1
0837                                33,3216  42675 C          DMPR    DAD*
0838  REF   1                      33,3217  27716 1                  GEOCCNS2
0839  REF   5  LAST  435           33,3220  02505 C                  FILDELV1 +8D,1
0840                                33,3221  41475 1          DMPR    PUSH
0841  REF   1                      33,3222  15330 C                  GEOCCNS5
0842                                33,3223  67300 C          TIX,1   SLOAD
0843  REF   2  LAST  429           33,3224  67204 C                  ALWAYSG
0844  REF   1                      33,3225  02647 C                  ERECTIM1
0845                                33,3226  71254 1          BZE     DLOAD
0846  REF   1                      33,3227  67240 C                  COMPGS
0847  REF   2  LAST   97           33,3230  02471 1                  THETAN1 +2
0848                                33,3231  45425 C          DSU     STADR
0849  REF   3  LAST  435           33,3232  61306 C          STODL   THETAN1 +2      ERECTION ONLY.
0850                                33,3233  77621 1          BDSU
0851  REF   4  LAST  435           33,3234  02473 C                  THETAN1 +4
0852  REF   5  LAST  435           33,3235  02473 C          STORE   THETAN1 +4
0853                                33,3236  77650 1          GOTO
0854  REF   1                      33,3237  67262 C                  ADDINDRF
0855                                33,3240  43345 1  COMPGS  DLOAD  DAD             COMPASS
0856  REF   6  LAST  435           33,3241  02467 C                  THETAN1
0857  REF   6  LAST  435           33,3242  02475 C                  FILDELV1
0858  REF   7  LAST  435           33,3243  16467 C          STODL   THETAN1
0859  REF   7  LAST  435           33,3244  02475 C                  FILDELV1
0860                                33,3245  44275 1          DMPR    BDSU
0861  REF   1                      33,3246  27720 1                  GEOCCNS3
0862  REF   8  LAST  435           33,3247  02473 C                  THETAN1 +4
0863  REF   9  LAST  435           33,3250  16473 C          STODL   THETAN1 +4
0864  REF   8  LAST  435           33,3251  02501 1                  FILDELV1 +4
0865                                33,3252  44275 1          DMPR    BDSU
0866  REF   2  LAST  435           33,3253  27720 1                  GEOCCNS3
0867  REF  10  LAST  435           33,3254  02471 1                  THETAN1 +2
0868                                33,3255  57325 1          PDDL    DMPR
0869  REF   3  LAST  435           33,3256  02503 C                  INTVEC1 +4
0870  REF   1                      33,3257  27722 C                  GEOCCNS4
0871                                33,3260  45421 1          BDSU    STADR
0872  REF  11  LAST  435           33,3261  75306 C          STORE   THETAN1 +2
0873                                33,3262  77776 1  ADDINDRF EXIT

0874  REF  12  LAST  434           33,3263  11'412 C ENDGTSAL CCS    LENGTHOT       IS 5 SEC OVER-THE TIME TO TORQ PLATFORM
0875  REF   3  LAST  432           33,3264  0 2522 C         TC      SLEEPIE        NO-SET UP NEXT WAITLIST CALL FOR .5 SEC
0876  REF   3  LAST  429           33,3265  0 3402 1         TC      CHKCOMED
0877  REF   2  LAST  187           33,3266  11'304 C         CCS     LGYRO          YES BUT ARE GYROS BUSY
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0878   REF   4  LAST  435   33,3267  1 2523 C            TCF     SLEEPIE +1      BUSY-GET THEM .5 SECONDS FROM NOW

0879   REF  26  LAST  434   33,3270  C 6006 1  LASTGIS   TC      INTPRET
0880                        33,3271   77775 1            VLOAD
0881   REF   9  LAST  421   33,3272   C2650 0            ERCOMP1
0882   REF   4  LAST  428   33,3273   16461 C            STODL   THETAX1
0883   REF   4  LAST  421   33,3274   02443 C            TMARK
0884   REF   8  LAST  431   33,3275   02457 C            STORE   ALK
0885                        33,3276   77776 1            EXIT                    PREVIOUS SECTION WAS FOR RESTARTS

0886   REF  12  LAST  433   33,3277  0 5301 C  RESTAIER  TC      PHASCHNG
0887                        33,3300   00275 1            OCT     00275
0888   REF  27  LAST  436   33,3301  C 6006 1            TC      INTPRET         ADD COMPASS COMMANDS INTO ERATE
0889                        33,3302   64375 1            VLOAD   MXV
0890   REF  12  LAST  435   33,3303   02467 C            THETAN1
0891   REF  27  LAST  434   33,3304   02672 0            XSM
0892                        33,3305   53372 1            VSL1    VAD
0893   REF   5  LAST  436   33,3306   02461 C            THETAX1
0894   REF  10  LAST  436   33,3307   16650 C            STODL   ERCOMP1
0895   REF   9  LAST  436   33,3310   02457 C            ALK
0896   REF   5  LAST  436   33,3311   02443 C            STORE   TMARK
0897                        33,3312   77776 1            EXIT
0898   REF   5  LAST  427   33,3313  0 2417 1            TC      EARTHR*         TORQUE IT ALL IN
0899   REF   2  LAST  435   33,3314  31'646 1            CAE     ERECTIM1
0900   REF   4  LAST  428   33,3315  55'631 C            TS      GEOSAVE1
0901   REF  13  LAST  436   33,3316  0 5301 C            TC      PHASCHNG
0902                        33,3317   00155 C            OCT     00155
0903   REF  28  LAST  436   33,3320  0 6006 1  RESTEST1  TC      INTPRET
0904                        33,3321   77775 1            VLOAD
0905   REF   5  LAST  425   33,3322   27113 1            SCHZEROS
0906   REF  13  LAST  436   33,3323   02467 C            STORE   THETAN1
0907                        33,3324   77776 1            EXIT
0912   REF   1              33,3325  11'632 C            CCS     PREMTRXC
09121  REF   1              33,3326  0 3375 C            TC      NOCHCRLD
09122  REF  14  LAST  436   33,3327  0 5301 C            TC      PHASCHNG
0913                        33,3330   00255 C            OCT     00255
09131  REF  29  LAST  436   33,3331  0 6006 1  RESTEST3  TC      INTPRET
0914                        33,3332   77745 1            DLOAD
09142  REF   2  LAST  168   33,3333   02634 1            LAUNCHAZ
0915                        33,3334   53025 C            DSU     BZE
09151  REF   2  LAST  434   33,3335   02640 1            OLDAZMTH
09152  REF   1              33,3336   67372 C            NOAZCHGE
09153                       33,3337   00001 C            STORE   OD
09154                       33,3340   43335 C            SLOAD   DAD
09155  REF   2  LAST  419   33,3341   27121 0            ONEDPP +1
0918   REF   2  LAST  436   33,3342   02633 C            PREMTRXC        DOES NOT CHANGE LAUNCHAZ
0919   REF   3  LAST  436   33,3343   16633 C            STODL   PREMTRXC
0920   REF   3  LAST  436   33,3344   02634 1            LAUNCHAZ
09201  REF   1              33,3345   16636 C            STODL   NEWAZMTH
09202                       33,3346   00001 C            OD
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09203  REF   1                33,3347   02654 1  ADERCOMP STORE  ERCOMP +4
09204                         33,3350   77776 1           EXIT
09205  REF   2  LAST  434     33,3351   0 3164 1           TC     POSN17C
09206  REF  15  LAST  436     33,3352   0 5301 C           TC     PHASCHNG
09207                         33,3353    00335 1           OCT    00335
0921                          33,3354   0 0006 1  RESCHNG  EXTEND
0922   REF   2  LAST  436     33,3355   3 1636 C           DCA    NEWAZMTH
0923   REF   3  LAST  436     33,3356   53'640 C           DXCH   OLDAZMTH
09231  REF  31  LAST  382     33,3357   3 4704 C           CA     BIT7          SPEND 320 SEC ERECTING
09232  REF  13  LAST  435     33,3360   55'412 C           TS     LENGTHOT
0924   REF  16  LAST  437     33,3361   0 5301 C           TC     PHASCHNG
0925                          33,3362    00075 C           OCT    00075
0926   REF   1                33,3363   3 3424 C  SPITGYRO  CA     ERCOMPPL
0927   REF  70  LAST  432     33,3364   0 4555 C           TC     BANKCALL
0928   REF   4  LAST  432     33,3365    17125 1           CADR   IMUPULSE
0929   REF  71  LAST  437     33,3366   0 4555 C           TC     BANKCALL
0930   REF   7  LAST  419     33,3367    17516 C           CADR   IMUSTALL
0931   REF   2  LAST  419     33,3370   0 3104 1           TC     SOMERR2
09311  REF   3  LAST  418     33,3371   0 2453 1           TC     ESTINS        RE-INITIALIZE

0932                          33,3372    77776 1  NOAZCHGE EXIT
0933   REF  58  LAST  434     33,3373   3 4712 1           CA     ONE
0934   REF   4  LAST  436     33,3374   55'632 C           TS     PREMTRXC
0941   REF   5  LAST  436     33,3375   11'631 C  NOCHORLD  CCS    GEOSAVE1
0942   REF   3  LAST  436     33,3376   55'646 C           TS     ERECTIM1      COUNTS DOWN FOR ERECTION.

0943   REF   1                33,3377   3 4334 1  ANNNNNN  CAF    NINE
0944   REF  14  LAST  437     33,3400   55'412 C           TS     LENGTHOT
0945   REF   5  LAST  436     33,3401   0 2523 1           TC     SLEEPIE +1

0946                          33,3402   0 0004 C  CHKCOMED INHINT
0947   REF  99  LAST  434     33,3403   4 4714 C           CS     ZERO
0948                          33,3404   0 0006 1           EXTEND
0949   REF   5  LAST  243     33,3405   06 030 1           RXOR   CHAN30        READ AND INVERT BITS IN CHANNEL 30
0950   REF  24  LAST  417     33,3406   7 4706 C           MASK   BIT5          LIFTOFF BIT
0951   REF 131  LAST  428     33,3407   10 000 C           CCS    A
0952   REF   1                33,3410   1 3417 1           TCF    PRELTERM      LIFTOFF HAS OCCURRED

0953   REF  25  LAST  437     33,3411   3 4706 1           CA     BIT5          CHECK FOR BACKUP LIFTOFF
0954   REF   8  LAST  381     33,3412   7 0101 C           MASK   FLAGWRD5      BIT5 FLAGWRD5
0955   REF 132  LAST  437     33,3413   10 000 C           CCS    A
0956   REF   2  LAST  437     33,3414   1 3417 1           TCF    PRELTERM      BACKUP RECEIVED

0957                          33,3415   0 0003 1           RELINT
0958   REF 150  LAST  428     33,3416   0 0002 C           TC     Q             CONTINUE PRELAUNCH

0959   REF   1                33,3417   3 7657 1  PRELTERM CA     PRIO22        PRELAUNCH DONE - SET UP P11
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0960   REF   6  LAST  383   33,3420  0 5103 0          TC      PRIOCHNG       INCREASE PRIORITY HIGHER THAN SERVICER
0961                        33,3421  0 0004 0          INHINT
0962   REF  34  LAST  378   33,3422  0 4574 0          TC      POSTJUMP
0963   REF   1               33,3423   70002 1         CADR    P11


0965   REF   2  LAST  437   33,3424   02647 0  ERCOMPPL ECADR   ERCOMP

0968   REF   3  LAST  387   26,3327            GEOCONS5 EQUALS HIDPHALF
0969                        33,3425   06200 0  1/PIPAGT OCT    06200
0970   REF   6  LAST  422      4375            17DECML  =      ND1            OCT 21
0971   REF  16  LAST  422      4374            19DECML  =      VD1            OCT 23
0972   REF   2  LAST  126      4731            1/2SECX  =      .5SEC
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09725 REF 55 LAST 427 5112 GEOSTRT4 EQUALS ENDOFJOB

P0973 OPTICAL VERIFICATION ROUTINES FOR GYRCOMPASS

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09735  REF   1                                          COUNT  33/P03

0974   REF  17  LAST  437   33,3426  0 5301 C  GCOMPVER TC     PHASCHNG      OPTICAL VERIFICATION ROUTINE
0975                        33,3427   00154 1            OCT    00154
0976   REF   4  LAST  425   33,3430  0 5243 1            TC     NEWMODEX      ENTERED BY VERB 65 ENTER
0977                        33,3431   00003 1            MM     03
09771  REF   1              33,3432  0 2037 1  SETNBPOS  TC     NBPOSPL
0978   REF  72  LAST  437   33,3433  0 4555 C            TC     BANKCALL
0979   REF   2  LAST  418   33,3434   16063 C            CADR   MKRELEAS
0980   REF  35  LAST  377   33,3435  3 4712 1  OPTDATA   CAF    BIT1          CALLS FOR AZIMUTH AND ELEVATION OF TARGE
0981                        33,3436  22 007 C            ZL                   T 1,THEN TARGET 2
0982   REF   1              33,3437  23'427 1            LXCH   RUN           AZIMUTH CLOCKWSE FROM NORTH TO TARGET
0983   REF  20  LAST  358   33,3440  55'047 1            TS     DSPTEM1 +2    ELEVATION MEASURED FROM HORIZONTAL
0984                        33,3441  0 0006 1            EXTEND
0985   REF   2  LAST  440   33,3442  5 1427 1            INDEX  RUN
0986   REF   1              33,3443  3 1433 1            DCA    TAZEL1
0987   REF  21  LAST  440   33,3444  53'046 C            DXCH   DSPTEM1
0988   REF   1              33,3445  3 3470 1            CAF    V05N30E
0989   REF  73  LAST  440   33,3446  0 4555 C            TC     BANKCALL
0990   REF   1              33,3447   20577 C            CADR   GODSPRET
0991   REF   1              33,3450  3 3456 C            CAF    VN0641
09911  REF  74  LAST  440   33,3451  0 4555 C            TC     BANKCALL
09912  REF   4  LAST  422   33,3452   20624 C            CADR   GOFLASH
09913  REF   1              33,3453  0 3611 1            TC     GCOMP5
09914                       33,3454  0 3457 1            TC     +3
09915                       33,3455  0 3445 1            TC     -8D
09916                       33,3456   01451 C  VN0641     VN     0641
0992   REF  22  LAST  440   33,3457  53'046 C            DXCH   DSPTEM1       TAZEL1  TARGET 1 AZIMUTH
0993   REF   3  LAST  440   33,3460  51'427 1            INDEX  RUN
0994   REF   2  LAST  440   33,3461  53'433 C            DXCH   TAZEL1        TAZEL1 +2 TARGET 2 AZIMUTH
0995   REF   4  LAST  440   33,3462  11'427 C            CCS    RUN
0996                        33,3463  1 3467 C            TCF    +4
0997   REF  26  LAST  416   33,3464  3 4711 1            CAF    TWO
0998   REF  55  LAST  422   33,3465  54 001 1            TS     L
0999   REF   1              33,3466  1 3437 C            TCF    OPTDATA +2    MPAC    1ST PASS=0  2ND PASS=2


09991  REF   1              33,3467  0 3531 C            TC     CONTIN33

099921                      33,3470   01236 1  V05N30E   VN     0530

10136  REF  30  LAST  436   33,3471  0 6006 1            TC     INTPRET       UNDYNAMIC ASSEMBLER
1014                        33,3472   77170 1  TAR/EREF  AXT,1   AXT,2        TARGET VECTOR
1015                        33,3473   00002 C                    2            SIN(EL)  -COS(AZ)COS(EL)   SIN(AZ)COS(EL
1016                        33,3474   00014 1                    12D
1017                        33,3475   40331 1            SSP    SETPD
1018   REF   3  LAST  421   33,3476   00052 C                    S2
1019                        33,3477   00006 1                    6
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1020                                33,3500   00001 0                 0
1021                                33,3501   60533 1  TAR1   SLOAD*  SR2              X1=2 X2=12 S2=6 X1=0 X2=6 S2=6
1022  REF   3  LAST  440             33,3502   02436 1                 TAZEL1 +3,1
1023                                33,3503   00001 0          STORE  0                PD00    ELEVATION    PD00
1024                                33,3504   77756 0          SIN
1025                                33,3505   10023 1          STORE  18D,2            PD06 ***    SIN(EL)   ***PD12
1026                                33,3506   77745 1          DLOAD
1027                                33,3507   00001 0                 0
1028                                33,3510   41546 0          COS    PUSH             PD00     COS(EL)   PD00
1029                                33,3511   47133 0          SLOAD* RTB
1030  REF   4  LAST  441             33,3512   02435 1                 TAZEL1 +2,1
1031  REF   4  LAST  396             33,3513   45510 1                 CDULOGIC
1032                                33,3514   00003 1          STORE  2                PD02        AZIMUTH   PD02
1033                                33,3515   41356 1          SIN    DMP
1034                                33,3516   00001 0                 0
1035                                33,3517   77752 1          SL1
1036                                33,3520   10027 0          STORE  22D,2            PD10  *** SIN(AZ)COS(EL)  ***PD16
1037                                33,3521   71545 0          DLOAD  COS
1038                                33,3522   00003 1                 2
1039                                33,3523   72405 0          DMP    SL1
1040                                33,3524   76076 1          DCOMP  AXT,1
1041                                33,3525   00000 1                 0
1042                                33,3526   10025 1          STORE  20D,2            PD08 ***   -COS(AZ)COS(EL)  ***PD14
1043                                33,3527   43504 1          TIX,2  RVQ
1044  REF   1                       33,3530   67501 1                 TAR1


10443                               33,3531                    BANK   33
104435 REF   4  LAST  425           33,2000                    SETLOC IMUCAL
10444                               33,3531                    BANK
104445 REF   1                                                 COUNT* $$/PD3

10445  REF  59  LAST  437           33,3531   3 4712 1 CONTIN33 CA     ONE
10446  REF   3  LAST  274           33,3532   54 735 1          TS     STARCODE
10447  REF 100  LAST  437           33,3533   3 4714 1          CA     ZERO
10448  REF   1                      33,3534   0 3626 0          TC     TARGDRVE
10449  REF  31  LAST  440           33,3535   0 6006 1          TC     INTPRET
104492                              33,3536    77624 1          CALL
104494 REF   1                      33,3537    67472 1                 TAR/EREF
104496                              33,3540    64375 1 NEXTBNKS VLOAD  MXV
1045                                33,3541    00007 0                 6D
1047   REF  28  LAST  436           33,3542    02672 0                 XSM
10471                               33,3543    77772 0          VSL1
1048   REF   3  LAST   92           33,3544    26736 1          STOVL  STARAD
1049                                33,3545    00015 0                 12D
1050                                33,3546    76521 0          MXV    VSL1
1051   REF  29  LAST  441           33,3547    02672 0                 XSM
1052   REF   4  LAST  441           33,3550    02744 1          STORE  STARAD +6
1053                                33,3551    77624 1          CALL
1054   REF   1                      33,3552    67723 0                 LITTLSUB
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1060   REF   4  LAST  432   33,3553   02414 1            STORE  LOSVEC
1061                        33,3554   77776 1            EXIT
1062   REF  75  LAST  44C   33,3555   0 4555 C           TC     BANKCALL
1063   REF   3  LAST  44C   33,3556    16063 C           CADR   MKRELEAS


1069   REF  27  LAST  44C   33,3557   3 4711 1  NEXENKSS CAF    TWO
1070   REF   4  LAST  441   33,3560   54 735 1           TS     STARCODE
1071   REF  16  LAST  407   33,3561   3 6211 C           CAF    SIX
1072   REF   2  LAST  441   33,3562   0 3626 C           TC     TARGDRVE
1073   REF  32  LAST  441   33,3563   0 6006 1           TC     INTPRET
1074                        33,3564    77624 1           CALL
1075   REF   2  LAST  441   33,3565    67723 C                  LITTLSUB
10751                       33,3566    24015 C           STOVL  12D
10752  REF   5  LAST  442   33,3567    02414 1                  LOSVEC
10753                       33,3570    34007 1           STCALL 06D
10754  REF   1               33,3571    47334 C                  AXISGEN
10755                       33,3572    77624 1           CALL
10756  REF   1               33,3573    47140 1                  CALCGTA
10757                       33,3574    77776 1           EXIT
1076   REF   1               33,3575   3 3622 1  GCOMP4  CAF    V06N93S
1077   REF  76  LAST  442   33,3576   0 4555 C           TC     BANKCALL
1078   REF   5  LAST  44C   33,3577    20624 C           CADR   GOFLASH
1079   REF   2  LAST  44C   33,3600   0 3611 1           TC     GCOMP5
1080                        33,3601   1 3603 C           TCF    +2
1081   REF   1               33,3602   1 3575 1           TCF    GCOMP4
1082   REF  33  LAST  442   33,3603   0 6006 1           TC     INTPRET
1083                        33,3604    53375 C           VLOAD  VAD
1084   REF  11  LAST  432   33,3605    02760 1                  OGC
1085   REF  11  LAST  436   33,3606    02650 C                  ERCOMP1
1086   REF  12  LAST  442   33,3607    02650 C           STORE  ERCOMP1
1087                        33,3610    77776 1           EXIT
1088   REF  77  LAST  442   33,3611   0 4555 C  GCOMP5  TC     BANKCALL
1089   REF   4  LAST  442   33,3612    16063 C           CADR   MKRELEAS
10895  REF  21  LAST  418   33,3613   0 5447 C           TC     DOWNFLAG
10896  REF   2  LAST  225   33,3614    00032 C           ADRES  TRM03FLG

1090   REF   5  LAST  44C   33,3615   0 5243 1           TC     NEWMODEX
1091                        33,3616    00002 C           MM     02
1092   REF  18  LAST  44C   33,3617   0 5301 C           TC     PHASCHNG
1093                        33,3620    00004 C           OCT    00004
1094   REF  56  LAST  439   33,3621   0 5112 C           TC     ENDOFJOB
1097                        33,3622    01535 C  V06N93S  VN     0693
1098   REF  23  LAST  433   33,3623   0 5537 C  GTSOPTCS TC     ALARM
1099                        33,3624    01602 1  GTSOPTSS OCT    01602
1100   REF   3  LAST  442   33,3625   0 3611 1           TC     GCOMP5


11001                       34,2002                      BANK   34
11002  REF   1               04,2000                      SETLOC IMUCAL1
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11003                          04,2617                    BANK

110035 REF   1                                            COUNT  34/CCMST

1119                           04,2617   62545 1  LATAZCHK DLOAD  SL2          CALLS FOR AZIMUTH AND LATITUDE
1120   REF   4  LAST  421       04,2620   02403 1                  LATITUDE
1121   REF  23  LAST  440       04,2621   15047 C          STODL   DSPTEM1 +1
1122   REF   3  LAST  415       04,2622   02401 C                  AZIMUTH
1123                           04,2623   77434 1          RTB     EXIT
1124   REF   3  LAST  281       04,2624   45543 1                  1STO2S
1125   REF 233  LAST  431       04,2625   56 154 1         XCH     MPAC
1126   REF  24  LAST  443       04,2626   55'045 C         TS      DSPTEM1
1127   REF  78  LAST  442       04,2627   0 4555 C         TC      BANKCALL
1128   REF   1                  04,2630    20607 1         CADR    CLEANDSP
1129   REF   1                  04,2631   3 2650 C         CAF     VNG0641
11291  REF  79  LAST  443       04,2632   0 4555 C         TC      BANKCALL
11292  REF   6  LAST  442       04,2633    20624 C         CADR    GOFLASH
11293                          04,2634   0 2636 C         TC      +2           NOT ALLOWED
11294                          04,2635   0 2637 1         TC      +2
11295                          04,2636   0 2631 1         TC      -5
1130   REF  34  LAST  442       04,2637   0 6006 1         TC      INTPRET
1131                           04,2640    47135 C         SLOAD   RTB
1132   REF  25  LAST  443       04,2641    01046 1                 DSPTEM1
1133   REF   5  LAST  441       04,2642    45510 1                 CDULCGIC
1134   REF   4  LAST  443       04,2643   02401 C                  STORE   AZIMUTH
11341                          04,2644   60535 1          SLOAD   SR2
11342  REF  26  LAST  443       04,2645   01047 C                  DSPTEM1 +1
11343  REF   5  LAST  443       04,2646   02403 1          STORE   LATITUDE
1135                           04,2647   77616 C          RVQ

11351                          04,2650   01451 C  VNG0641  VN      0641
1136                           33,3626                    BANK    33
1137   REF   5  LAST  441       33,2000                    SETLOC  IMUCAL
1138                           33,3626                    BANK

1139   REF   2 LAST  440 TO  441:     67    67*          COUNT*  $$/P03
1140                           33,3626   0 0006 1  TARGDRVE EXTEND
1141   REF   1                  33,3627   23'424 1         QXCH    QPLAC
1142   REF   1                  33,3630   55'431 1         TS      TARG1/2
11421  REF  35  LAST  443       33,3631   0 6006 1         TC      INTPRET
1143                           33,3632    77624 1         CALL
1144   REF   2  LAST  441       33,3633    67472 1                 TAR/EREF
1145                           33,3634    76740 C         LXC,1   VLOAD*
1146   REF   2  LAST  443       33,3635    02431 C                 TARG1/2
1147                           33,3636    00007 C                 6D,1
1148   REF  10  LAST  281       33,3637    36766 C         STCALL  STAR
1149   REF   1                  33,3640    46053 C                 SXTARG
1150                           33,3641    77776 1         EXIT
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1151    REF    6  LAST  281    33,3642   3 1773 C            CA      SAC
1152    REF    4  LAST  235    33,3643   55'161 1            TS      DESOPTS
1153    REF    6  LAST  281    33,3644   3 1775 C            CA      PAC
1154    REF    5  LAST  235    33,3645   55'160 C            TS      DESOPTT
1155    REF  101  LAST  441    33,3646   3 4714 1  RETARG    CAF     ZERO
1156    REF   22  LAST  383    33,3647   55'303 1            TS      OPTIND
1157    REF   60  LAST  441    33,3650   3 4712 1            CAF     ONE
1158    REF   80  LAST  443    33,3651   0 4555 C            TC      BANKCALL
1159    REF    1              33,3652    16002 1            CADR    SXTMARK
1160    REF   81  LAST  444    33,3653   0 4555 C            TC      BANKCALL
1161    REF    1              33,3654    17512 1            CADR    OPTSTALL
1162    REF    1              33,3655   0 3623 C            TC      GTSOPTCS
1162C1  REF   11  LAST  382    33,3656   30 075 C            CAE     FLAGWRD1
1162C2  REF    1              33,3657   7 4707 1            MASK    TRMO3BIT
1162C3  REF  133  LAST  437    33,3660   10 000 C            CCS     A
1162C4  REF    4  LAST  442    33,3661   0 3611 1            TC      GCOMP5

11621   REF   26  LAST  260    33,3662   51'330 C            INDEX   MARKSTAT
11622   REF    8  LAST  258    33,3663   3 0052 C            CA      QPRET
11623                          33,3664   0 0006 1            EXTEND
11624   REF    1              33,3665   1 3667 1            BZF     RETARG1
1163    REF    2  LAST  443    33,3666   0 1424 1            TC      QPLAC

1164    REF  102  LAST  444    33,3667   3 4714 1  RETARG1   CA      ZERO            RELEASE PREVICUSLY GRABBED VAC AREA
1165    REF   27  LAST  444    33,3670   57'330 C            XCH     MARKSTAT
1166    REF  134  LAST  444    33,3671   10 000 C            CCS     A
1167    REF  135  LAST  444    33,3672   50 000 1            INDEX   A
1168    REF  136  LAST  444    33,3673   54 000 C            TS      A
1169    REF    1              33,3674   1 3646 1            TCF     RETARG          GO DO SXTMARK AGAIN
1170                          33,3675                       BANK    33
1171    REF    6  LAST  443    33,2000                      SETLOC  IMUCAL
1172                          33,3675                       BANK
1173    REF    3 LAST  443 TO  444:     39   106*           COUNT*  $$/P03
1200                          33,3675    30341 1  PIPASC    2DEC    .76376833
1200                          33,3676    22444 C
1201                          33,3677    57223 0  VELSC     2DEC    -.52223476
1201                          33,3700    66451 1
1202                          33,3701    05427 C  ALSK      2DEC    .17329931
1202                          33,3702    12577 1
1203                          33,3703    77567 C            2DEC    -.00835370
1203                          33,3704    44202 1
1204                          33,3705    24276 1  GEORGEJ   2DEC    .63661977
1204                          33,3706    14066 1
1205                          33,3707    23073 1  GEORGEK   2DEC    .59737013
1205                          33,3710    11773 1
1206                          33,3711    00055 1  2DEGRES   2DEC    .00277778
1206                          33,3712    20267 C
1207                          33,3713    03146 1  GEOCONS1  2DEC    .1
1207                          33,3714    14632 C
```

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1208                        33,3715   00121 C  GEOCONS2 2DEC    .005
1208                        33,3716   35341 1
1209                        33,3717   01767 C  GEOCONS3 2DEC    .062
1209                        33,3720   31666 C
1210                        33,3721   00004 C  GEOCONS4 2DEC    .0003
1210                        33,3722   35223 1
12525 REF   3 LAST  434 TC  440:   146   289*          COUNT    33/P02
1253                        33,3723   77620 C  LITTLSUB STQ
1254  REF   3 LAST  444     33,3724   02424 1                   QPLAC
1255                        33,3725   76740 C          LXC,1    VLOAD*
1256  REF  28 LAST  444     33,3726   01330 C                   MARKSTAT
1257                        33,3727   00003 1                   2,1
1258  REF   4 LAST   72     33,3730   34767 C          STCALL   CDUSPOT
1259  REF   1               33,3731   46000 C                   SXTNB
1260                        33,3732   77624 1          CALL
1261  REF   1               33,3733   47572 1                   TRG*NBSM
1262                        33,3734   77650 1          GOTO
1263  REF   4 LAST  445     33,3735   02424 1                   QPLAC


1265                        33,3736   77776 1          EXIT
1300  REF  36 LAST  443     33,3737   0 6006 1 AZMTHCG1 TC       INTPRET
1301                        33,3740   47145 1          DLOAD    RTB
1302  REF   3 LAST  437     33,3741   02636 C                   NEWAZMTH
1303  REF   4 LAST  443     33,3742   45543 1                   1STO2S
1304                        33,3743   77776 1          EXIT
1305  REF 234 LAST  443     33,3744   56 154 1         XCH      MPAC
1306  REF  27 LAST  443     33,3745   55*045 C         TS       DSPTEM1
1307  REF  82 LAST  444     33,3746   0 4555 C         TC       BANKCALL
1308  REF   2 LAST  443     33,3747    20607 1         CADR     CLEANDSP
1309  REF   1               33,3750   3 3772 C         CAF      VN0629
1310  REF  83 LAST  445     33,3751   0 4555 C         TC       BANKCALL
1311  REF   7 LAST  443     33,3752    20624 C         CADR     GOFLASH
1312                        33,3753   1 3755 1         TCF      +2
1313                        33,3754   1 3756 1         TCF      +2
1314                        33,3755   1 3750 1         TCF      -5
1315  REF  37 LAST  445     33,3756   0 6006 1         TC       INTPRET
1316                        33,3757    47135 C         SLOAD    RTB
1317  REF  28 LAST  445     33,3760    01046 1                  DSPTEM1
1318  REF   6 LAST  443     33,3761    45510 1                  CDULOGIC
1319  REF   4 LAST  436     33,3762    02634 1         STORE    LAUNCHAZ
1320                        33,3763    77776 1         EXIT
1321  REF 103 LAST  444     33,3764   3 4714 1         CA       ZERO
1322  REF   5 LAST  437     33,3765   55*632 C         TS       PREMTRXC
1323  REF  19 LAST  442     33,3766   0 5301 C         TC       PHASCHNG
1324                        33,3767    00004 0         OCT      00004
1325  REF  35 LAST  438     33,3770   0 4574 C         TC       POSTJUMP
13255 REF   5 LAST  360     33,3771    21176 1         CADR     PINBRNCH

1326                        33,3772    01435 1 VN0629  VN       0629
```

*** END OF KOOLADE .064 ***

L GROUND TRACKING DETERMINATION PROGRAM - P21 USER'S PAGE NO. 1 EO S3

```
P0001   GROUND TRACKING DETERMINATION PROGRAM P21
R0002   PROGRAM DESCRIPTION
R0003   MCC NO - 1
R0004   MCC BY - N.M.NEVILLE
R0005   FUNCTIONAL DECRIPTION-
R0006
R0007   TO PROVIDE THE ASTRONAUT DETAILS OF THE LM OR CSM GROUND TRACK WITHOUT
R0008   THE NEED FOR GROUND COMMUNICATION (REQUESTED BY DSKY).
R0009   CALLING SEQUENCE -
R0010
R0011   ASTRONAUT REQUEST THROUGH DSKY V37E21E
R0012   SUBROUTINES CALLED-
R0013
R0014   GOPERF4
R0015   GOFLASH
R0016   THISPREC
R0017   OTHPREC
R0018   LAT-LONG
R0019   NORMAL EXIT MODES-
R0020
R0021   ASTRONAUT REQUEST TROUGH DSKY TO TERMINATE PROGRAM V34E
R0022   ALARM OR ABORT EXIT MODES-
R0023
R0024   NONE
R0025   OUTPUT -
R0026
R0027   OCTAL DISPLAY OF OPTION CODE AND VEHICLE WHOSE GROUND TRACK IS TO BE
R0028   COMPUTED
R0029           OPTION CODE  00002
R0030           THIS         00001
R0031           OTHER        00002
R0032   DECIMAL DISPLAY OF TIME TO BE INTEGRATED TO HOURS , MINUTES , SECONDS
R0033   DECIMAL DISPLAY OF LAT,LONG,ALT
R0034   ERASABLE INITIALIZATION REQUIRED
R0035
R0036   AXC     2DEC   4.652459653 E-5   RADIANS        "68-69 CONSTANTS"
R0037
R0038   -AYC    2DEC   2.147535898 E-5   RADIANS
R0039
R0040   AZC     2DEC   .7753206164       REVOLUTIONS
R0041   FOR LUNAR ORBITS 504LM VECTOR IS NEEDED
R0042
R0043   504LM   2DEC   -2.700340600 E-5  RADIANS
R0044
R0045   504LM_2 2DEC   -7.514128400 E-4  RADIANS
R0046
R0047   504LM_4 2DEC   -2.553198641 E-4  RADIANS
R0048
R0049   NONE
R0050   DEBRIS
```

L GROUND TRACKING DETERMINATION PROGRAM - P21 USER'S PAGE NO. 2 EO S3

```
R0051
R0052   CENTRALS-A,Q,L
R0053   OTHER-THOSE USED BY THE ABOVE LISTED SUBROUTINES
R0054   SEE LEMPREC,LAT-LONG
 0055   REF   3  LAST  277    30,2000                    SBANK= LOWSUPER        FOR LOW 2CADR'S.

 0056                         33,3773                    BANK   33
 0057   REF   1               37,2000                    SETLOC P20S
 0058                         37,2001                    BANK

 0059   REF   3  LAST  255    E4,1715                    EBANK= P21TIME
 0060   REF   1                                          COUNT  24/P21

 0061   REF  61  LAST  444    37,2001   3 4712 1 PROG21  CAF    ONE
 0062   REF   2  LAST  274    37,2002   55'132 1         TS     OPTION2         ASSUMED VEHICLE IS LM , R2 = 00001
 0063   REF  21  LAST  367    37,2003   3 4711 1         CAF    BIT2             OPTION 2
 0064   REF  64  LAST  445    37,2004   0 4555 C         TC     BANKCALL
 0065   REF   1               37,2005    20761 C         CADR   GOPERF4
 0066   REF   3  LAST  383    37,2006   0 4106 1         TC     GOTOPOOH        TERMINATE
 0067                         37,2007   0 2011 C         TC     +2              PROCEED VALUE OF ASSUMED VEHICLE OK
 0068                         37,2010   0 2003 C         TC     -5              R2 LOADED THROUGH DSKY
 0069   REF   1               37,2011   3 2102 C P21PROG1 CAF    V6N34           LOAD DESIRED TIME OF LAT-LONG.
 0070   REF  85  LAST  448    37,2012   0 4555 C         TC     BANKCALL
 0071   REF   8  LAST  445    37,2013    20624 C         CADR   GOFLASH
 0072   REF   4  LAST  448    37,2014   0 4106 1         TC     GOTOPOOH        TERM
 0073                         37,2015   0 2017 C         TC     +2              PROCEED VALUES OK
 0074                         37,2016   0 2011 C         TC     -5              TIME LOADED THRCUGH DSKY
 0075   REF  38  LAST  445    37,2017   0 6006 1         TC     INTPRET
 0076                         37,2020    77745 1         DLOAD
 0077   REF  29  LAST  445    37,2021    01046 1                DSPTEM1
 0078   REF   4  LAST  448    37,2022    02316 1         STORE  P21TIME
 0079                         37,2023    45335 C         SLOAD  DSU
 0080   REF   3  LAST  448    37,2024    01133 1                OPTION2
 0081   REF   1               37,2025    36100 C                P21ONENN
 0082                         37,2026    71230 C         BHIZ   DLOAD
 0083   REF   1               37,2027    76042 C                P21PROG2        VEHICLE TO BE INTEGRATED IS LEM
 0084   REF   5  LAST  448    37,2030    02316 1                P21TIME         VEHICLE TO BE INTEGRATED IS CSM
 0085   REF   2  LAST  203    37,2031    34041 C         STCALL TDEC1           INTEGRATE TO TIME SPECIFIED IN TDEC
 0086   REF   1               37,2032    27036 1                OTHPREC         ADJUST UNITS FOR LAT-LONG ROUTINE
 0087                         37,2033    46135 1 P21PROGA SLOAD BHIZ
 0088   REF   1               37,2034    00050 1                X2
 0089   REF   1               37,2035    76050 C                P21PROG3
 0090                         37,2036    43175 C         VLOAD  SETGC
 0091   REF   1               37,2037    00001 C                RATT
 0092   REF   1               37,2040    01423 C                LUNAFLAG
 0093   REF   1               37,2041    76053 C                P21PROG4
 0094                         37,2042    77745 1 P21PROG2 DLOAD
 0095   REF   6  LAST  448    37,2043    02316 1                P21TIME
 0096   REF   3  LAST  448    37,2044    34041 C         STCALL TDEC1
 0097   REF   1               37,2045    27022 1                THISPREC
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L GROUND TRACKING DETERMINATION PROGRAM - P21 USER'S PAGE NO. 3 E4 S3

```
0098                                37,2046   77650 1            GOTO
0099   REF   1                     37,2047   76033 C                       P21PROGA
0100                                37,2050   43175 C  P21PROG3 VLOAD      CLEAR
0101   REF   2  LAST  448          37,2051   00001 C                       RATT
0102   REF   2  LAST  448          37,2052   01663 C                       LUNAFLAG
0103   REF   2  LAST   86          37,2053   16152 C  P21PROG4 STODL      ALPHAV
0104   REF   1                     37,2054   00015 C                       TAT
0105                                37,2055   45014 C            CLEAR     CALL
0106   REF   1                     37,2056   00662 C                       ERADFLAG
0107   REF   1                     37,2057   26322 C                       LAT-LONG
0108                                37,2060   77776 1            EXIT
0109   REF   1                     37,2061  3 2101 C            CAF       V06N43      DISPLAY LAT,LONG,ALT
0110   REF  66  LAST  448          37,2062  0 4555 C            TC        BANKCALL    LAT,LONG = 1/2 REVS 80
0111   REF   9  LAST  448          37,2063    20624 C            CADR      GOFLASH     ALT = KM  814
0112   REF   5  LAST  448          37,2064  0 4106 1            TC        GOTOPOOH    TERM
0113   REF   6  LAST  449          37,2065  0 4106 1            TC        GOTOPOOH
0114   REF  39  LAST  448          37,2066  0 6006 1            TC        INTPRET     V32E RECYCLE
0115                                37,2067   43345 1            DLOAD     DAD
0116   REF   7  LAST  448          37,2070   02316 1                       P21TIME
0117   REF   1                     37,2071   36076 C                       600SEC      600 SECONDS OR 10 MIN
0118   REF  30  LAST  448          37,2072   01046 1            STORE     DSPTEM1
0119                                37,2073   77634 C            RTB
0120   REF   1                     37,2074   76011 C                       P21PROG1
0121                                37,2075   00003 1  600SEC    2DEC      60000       10 MIN
0121                                37,2076   25140 C
0122                                37,2077   00001 C  P21CNENN  OCT       00001       NEEDED TO DETERMINE VEHICLE
0123                                37,2100   00000 1                OCT       00000       TO BE INTEGRATED
0124                                37,2101   01453 1  V06N43    VN        00643
0125                                37,2102   01442 1  V6N34     VN        00634
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P0010 TRANSFER PHASE INITIATION (TPI) PROGRAMS (P34 AND P74)

R0011 MCD NC -1 LCG SECTION - P32-P35, P72-P75
R0012 MCD BY WHITE.P DATE 1JUNE67

R0013 PURPOSE

R0014 (1) TO CALCULATE THE REQUIRED DELTA V AND OTHER INITIAL CONDITIONS
R0015 REQUIRED BY THE ACTIVE VEHICLE FOR EXECUTION OF THE TRANSFER
R0016 PHASE INITIATION (TPI) MANEUVER, GIVEN -

R0017 (A) TIME OF IGNITION TIG (TPI) OR THE ELEVATION ANGLE (E) OF
R0018 THE ACTIVE/PASSIVE VEHICLE LOS AT TIG (TPI).

R0019 (B) CENTRAL ANGLE OF TRANSFER (CENTANG) FROM TIG (TPI) TO
R0020 INTERCEPT TIME (TIG (TPF)).

R0021 (2) TO CALCULATE TIG (TPI) GIVEN E OR E GIVEN TIG (TPI).

R0022 (3) TO CALCULATE THESE PARAMETERS BASED UPON MANEUVER DATA
R0023 APPROVED AND KEYED INTO THE DSKY BY THE ASTRONAUT.

R0024 (4) TO DISPLAY TO THE ASTRONAUT AND THE GROUND CERTAIN DEPENDENT
R0025 VARIABLES ASSOCIATED WITH THE MANEUVER FOR APPROVAL BY THE
R0026 ASTRONAUT/GROUND.

R0027 (5) TO STORE THE TPI TARGET PARAMETERS FOR USE BY THE DESIRED
R0028 THRUSTING PROGRAM.

R0029 ASSUMPTIONS

R0030 (1) LM ONLY - THIS PROGRAM IS BASED UPON PREVIOUS COMPLETION OF
R0031 THE CONSTANT DELTA ALTITUDE (CDH) PROGRAM (P33/P73).
R0032 THEREFORE -

R0033 (A) AT A SELECTED TPI TIME (NOW IN STORAGE) THE LINE OF SIGHT
R0034 BETWEEN THE ACTIVE AND PASSIVE VEHICLES WAS SELECTED TO BE
R0035 A PRESCRIBED ANGLE (E) (NOW IN STORAGE) FROM THE
R0036 HORIZONTAL PLANE DEFINED BY THE ACTIVE VEHICLE POSITION.

R0037 (B) THE TIME BETWEEN CDH IGNITION AND TPI IGNITION WAS
R0038 COMPUTED TO BE GREATER THAN 10 MINUTES.

R0039 (C) THE VARIATION OF THE ALTITUDE DIFFERENCE BETWEEN THE
R0040 ORBITS WAS MINIMIZED.

R0041 (D) THE PERICENTER ALTITUDES OF ORBITS FOLLOWING CSI AND

R0042 CDH WERE COMPUTED TO BE GREATER THAN 35,000 FT FOR LUNAR

R0043 ORBIT OR 85 NM FOR EARTH ORBIT.

R0044 (E) THE CSI AND CDH MANEUVERS WERE ASSUMED TO BE PARALLEL TO
R0045 THE PLANE OF THE PASSIVE VEHICLE ORBIT. HOWEVER, CREW
R0046 MODIFICATION OF DELTA V (LV) COMPONENTS MAY HAVE RESULTED
R0047 IN AN OUT-OF-PLANE MANEUVER.

R0048 (2) STATE VECTOR UPDATED BY P27 ARE DISALLOWED DURING AUTOMATIC
R0049 STATE VECTOR UPDATING INITIATED BY P20 (SEE ASSUMPTION (4)).

R0050 (3) THIS PROGRAM MUST BE DONE OVER A TRACKING STATION FOR REAL
R0051 TIME GROUND PARTICIPATION IN DATA INPUT AND OUTPUT. COMPUTED
R0052 VARIABLES MAY BE STORED FOR LATER VERIFICATION BY THE GROUND.
R0053 THESE STORAGE CAPABILITIES ARE LIMITED ONLY TO THE PARAMETERS
R0054 FOR ONE THRUSTING MANEUVER AT A TIME EXCEPT FOR CONCENTRIC
R0055 FLIGHT PLAN MANEUVER SEQUENCES.

R0056 (4) THE RENDEZVOUS RADAR MAY OR MAY NOT BE USED TO UPDATE THE LM
R0057 OR CSM STATE VECTORS FOR THIS PROGRAM. IF RADAR USE IS
R0058 DESIRED THE RADAR WAS TURNED ON AND LOCKED ON THE CSM BY
R0059 PREVIOUS SELECTION OF P20. RADAR SIGHTING MARKS WILL BE MADE
R0060 AUTOMATICALLY APPROXIMATELY ONCE A MINUTE WHEN ENABLED BY THE
R0061 TRACK AND UPDATE FLAGS (SEE P20). THE RENDEZVOUS TRACKING
R0062 MARK COUNTER IS ZEROED BY THE SELECTION OF P20 AND AFTER EACH
R0063 THRUSTING MANEUVER.

R0064 (5) THE ISS NEED NOT BE ON TO COMPLETE THIS PROGRAM.

R0065 (6) THE OPERATION OF THE PROGRAM UTILIZES THE FOLLOWING FLAGS -

R0066 ACTIVE VEHICLE FLAG - DESIGNATES THE VEHICLE WHICH IS
R0067 DOING RENDEZVOUS THRUSTING MANEUVERS TO THE PROGRAM WHICH
R0068 CALCULATES THE MANEUVER PARAMETERS. SET AT THE START OF
R0069 EACH RENDEZVOUS PRE-THRUSTING PROGRAM.

R0070 FINAL FLAG - SELECTS FINAL PROGRAM DISPLAYS AFTER CREW HAS
R0071 SELECTED THE FINAL MANEUVER COMPUTATION CYCLE.

R0072 EXTERNAL DELTA V FLAG - DESIGNATES THE TYPE OF STEERING
R0073 REQUIRED FOR EXECUTION OF THIS MANEUVER BY THE THRUSTING
R0074 PROGRAM SELECTED AFTER COMPLETION OF THIS PROGRAM.

R0075 (7) ONCE THE PARAMETERS REQUIRED FOR COMPUTION OF THE MANEUVER
R0076 HAVE BEEN COMPLETELY SPECIFIED, THE VALUE OF THE ACTIVE
R0077 VEHICLE CENTRAL ANGLE OF TRANSFER IS COMPUTED AND STORED.
R0078 THIS NUMBER WILL BE AVAILABLE FOR DISPLAY TO THE ASTRONAUT
R0079 THROUGH THE USE OF V06N52.

R0080 THE ASTRONAUT WILL CALL THIS DISPLAY TO VERIFY THAT THE
R0081 CENTRAL ANGLE OF TRANSFER OF THE ACTIVE VEHICLE IS NOT WITHIN

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R0082              170 TO 190 DEGREES.  IF THE ANGLE IS WITHIN THIS ZONE THE
R0083              ASTRONAUT SHOULD REASSESS THE INPUT TARGETING PARAMETERS BASED
R0084              UPON DELTA V AND EXPECTED MANEUVER TIME.

R0085          (8) THIS PROGRAM IS SELECTED BY THE ASTRONAUT BY DSKY ENTRY -

R0086                  P34 IF THIS VEHICLE IS ACTIVE VEHICLE.

R0087                  P74 IF THIS VEHICLE IS PASSIVE VEHICLE.

R0088    INPUT

R0089          (1) TTPI      TIME OF THE TPI MANEUVER
R0090          (2) ELEV      DESIRED LOS ANGLE AT TPI
R0091          (3) CENTANG   ORBITAL CENTRAL ANGLE OF THE PASSIVE VEHICLE DURING
R0092                        TRANSFER FROM TPI TO TIME OF INTERCEPT

R0093    OUTPUT

R0094          (1) TRKMKCNT NUMBER OF MARKS
R0095          (2) TTOGO    TIME TO GO
R0096          (3) +MCA     MIDDLE GIMBAL ANGLE
R0097          (4) TTPI     COMPUTED TIME OF TPI MANEUVER
R0098                OR
R0099               ELEV    COMPUTED LOS ANGLE AT TPI
R0100          (5) POSTTPI  PERIGEE ALTITUDE AFTER THE TPI MANEUVER
R0101          (6) DELVTPI  MAGNITUDE OF DELTA V AT TPI
R0102          (7) DELVTPF  MAGNITUDE OF DELTA V AT INTERCEPT
R0103          (8) DVLOS    DELTA VELOCITY AT TPI - LINE OF SIGHT
R0104          (9) DELVLVC  DELTA VELOCITY AT TPI - LOCAL VERTICAL COORDINATES

R0105    DOWNLINK

R0114          (1) TTPI     TIME OF THE TPI MANEUVER
R0115          (2) TIG      TIME OF THE TPI MANEUVER
R0116          (3) ELEV     DESIRED LOS ANGLE AT TPI
R0117          (4) CENTANG  ORBITAL CENTRAL ANGLE OF THE PASSIVE VEHICLE DURING
R0118                       TRANSFER FROM TPI TO TIME OF INTERCEPT
R0119          (5) DELVEET3 DELTA VELOCITY AT TPI - REFERENCE COORDINATES
R0120          (6) TPASS4   TIME OF INTERCEPT
R0121    COMMUNICATION TO THRUSTING PROGRAMS

R0122          (1) TIG      TIME OF THE TPI MANEUVER
R0123          (2) RTARG    OFFSET TARGET POSITION
R0124          (3) TPASS4   TIME OF INTERCEPT
R0125          (4) XDELVFLG RESET TO INDICATE LAMBERT (AIMPOINT) VG COMPUTATION

R0126    SUBROUTINES USED

R0127          AVFLAGA
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R0128           AVFLAGP
R0129           VNPOCH
R0130           DISPLAYE
R0131           SELECTMU
R0132           PRECSET
R0133           S33/34.1
R0134           ALARM
R0135           BANKCALL
R0136           CCFLASH
R0137           GOTOPOOH
R0138           TIMETHET
R0139           S34/35.2
R0140           PERIAPO1
R0141           SHIFTR1
R0142           S34/35.5
R0143           VN1645

 0144   REF  1                  35,2000                         SETLOC CSI/CDH
 0145                           35,2000                         BANK
 0146   REF  5  LAST  248       E4,1770                         EBANK= SUBEXIT
 0147   REF  1                                                  COUNT  35/P3474

 0148   REF  1                  35,2000  0 3726 1  P34         TC     AVFLAGA
 0149   REF  1                  35,2001  0 2003 C              TC     P34/P74A
 0150   REF  1                  35,2002  0 3741 C  P74         TC     AVFLAGP
 0151   REF  1                  35,2003  0 3746 1  P34/P74A    TC     P20FLGON        SET UPDATFLG, TRACKFLG
01515   REF  1                  35,2004  3 3125 1              CAF    V06N37          TTPI
 0152   REF  1                  35,2005  0 3114 C              TC     VNPOCH
 0153   REF  1                  35,2006  0 3073 C              TC     DISPLAYE        ELEV AND CENTANG
 0154   REF  40 LAST  449       35,2007  0 6006 1              TC     INTPRET
 0155                           35,2010    71214 C             CLEAR  DLOAD
 0156   REF  3  LAST   47       35,2011    01270 C                    ETPIFLAG
 0157   REF  4  LAST  265       35,2012    03663 1                    TTPI
 0158   REF  16 LAST  265       35,2013    17413 1             STODL  TIG
 0159   REF  5  LAST  273       35,2014    03744 C                    ELEV
 0160                           35,2015    43054 1             BZE    SET
 0161   REF  1                  35,2016    72020 C                    P34/P74B
 0162   REF  4  LAST  453       35,2017    01070 1                    ETPIFLAG
 0163                           35,2020    77624 1  P34/P74B   CALL
 0164   REF  1                  35,2021    10716 C                    SELECTMU
 0165                             0032             DELELC     EQUALS 26D
 0166                           35,2022    43145 C  P34/P74C   DLOAD  SET
 0167   REF  2  LAST   31       35,2023    15332 1                    ZEROVECS
 0168   REF  1                  35,2024    03461 1                    ITSWICH
 0169                           35,2025    43014 C             BON    CLEAR
 0170   REF  5  LAST  453       35,2026    01310 1                    ETPIFLAG
 0171   REF  1                  35,2027    72031 C                    SWCHSET
 0172   REF  2  LAST  453       35,2030    03661 C                    ITSWICH
 0173   REF  1                  35,2031    02364 1  SWCHSET   STORE  NOMTFI
 0174                           35,2032    43345 1  INTLOOP   DLOAD  DAD
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0175  REF   5  LAST  453   35,2033   03663 1                 TTPI
0176  REF   2  LAST  453   35,2034   02364 1                 NOMTPI
0177  REF   4  LAST  448   35,2035   34041 0          STCALL TDEC1
0178  REF   1              35,2036   45354 1                 PRECSET
0179                       35,2037   77624 1          CALL
0180  REF   1              35,2040   72212 0                 S33/34.1
0181                       35,2041   77454 1          BZE    EXIT
0182  REF   1              35,2042   72053 1                 SWCHCLR
0183  REF  24  LAST  442   35,2043   0 5537 0         TC     ALARM
0184                       35,2044    00611 1         OCT    611
0185  REF   1              35,2045   3 4743 0         CAF    V05N09
0186  REF  87  LAST  449   35,2046   0 4555 0         TC     BANKCALL
0187  REF  10  LAST  449   35,2047    20624 0         CADR   GOFLASH
0188  REF   7  LAST  449   35,2050   0 4106 1         TC     GOTOPOOH
0189  REF   2  LAST  453   35,2051   0 2003 0         TC     P34/P74A      PROCEED
0190                       35,2052   0 2043 1         TC     -7            V32

0191                       35,2053    43014 0  SWCHCLR BONCLR BON
0192  REF   3  LAST  453   35,2054    03601 0                 ITSWICH
0193  REF   1              35,2055    72032 0                 INTLOOP
0194  REF   6  LAST  453   35,2056    01310 1                 ETPIFLAG
0195  REF   1              35,2057    72063 1                 P34/P74D      DISPLAY TTPI
0196                       35,2060    77776 1          EXIT
0197  REF   2  LAST  453   35,2061   0 3073 0         TC     DISPLAYE      DISPLAY ELEV AND CENTANG
0198  REF   1              35,2062   0 2066 0         TC     P34/P74E
0199                       35,2063    77776 1  P34/P74D EXIT
0200  REF   2  LAST  453   35,2064   3 3125 1         CAF    V06N37        TTPI
0201  REF   2  LAST  453   35,2065   0 3114 0         TC     VNPOOH
0202  REF  41  LAST  453   35,2066   0 6006 1  P34/P74E TC     INTPRET
0203                       35,2067    71201 1         SETPD  DLOAD
0204                       35,2070    00001 0                 0D
0205  REF   2  LAST  123   35,2071    03746 1                 RTX1
0206  REF   2  LAST  432   35,2072    14047 1         STODL  X1
0207  REF   4  LAST  273   35,2073    03754 1                 CENTANG
0208                       35,2074    71406 0         PUSH   COS
0209  REF   2  LAST   93   35,2075    16734 0         STODL  CSTH
0210                       35,2076    77756 0         SIN
0211  REF   2  LAST   93   35,2077    26732 0         STOVL  SNTH
0212  REF   2  LAST  119   35,2100    03554 0                 RPASS3
0213                       35,2101    77657 0         VSR*
0214                       35,2102    57176 0                 0,2
0215  REF   1              35,2103    26657 1         STOVL  RVEC
0216  REF   2  LAST  119   35,2104    03562 0                 VPASS3
0217                       35,2105    43057 1         VSR*   SET
0218                       35,2106    57176 0                 0,2
0219  REF   1              35,2107    03466 0                 RVSW
0220  REF   2  LAST   93   35,2110    36746 1         STCALL VVEC
0221  REF   1              35,2111    24737 1                 TIMETHET
0222                       35,2112    77745 1         DLOAD
0223  REF   6  LAST  454   35,2113    03663 1                 TTPI
```

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0224   REF   2  LAST  120   35,2114   03503 1   STORE  INTIME     FOR INITVEL
0225                       35,2115   77615 0   DAD
0226   REF   1              35,2116   00037 0          T         RENDEZVOUS TIME
0227   REF   4  LAST  170   35,2117   37656 0   STCALL TPASS4    FOR INITVEL
0228   REF   1              35,2120   72534 0          S34/35.2
0229                       35,2121   51575 1   VLOAD  ABVAL
0230   REF   4  LAST  170   35,2122   03646 0          DELVEET3
0231   REF   4  LAST  273   35,2123   26635 0   STOVL  DELVTPI
0232   REF   2  LAST  120   35,2124   03640 0          VPASS4
0233                       35,2125   51451 0   VSU    ABVAL
0234   REF   3  LAST  120   35,2126   03620 0          VTPRIME
0235   REF   4  LAST  273   35,2127   26637 1   STOVL  DELVTPF
0236   REF   3  LAST  119   35,2130   03540 0          RACT3
0237                       35,2131   45115 0   PDVL   CALL
0238   REF   3  LAST  120   35,2132   03612 1          VIPRIME
0239   REF   1              35,2133   45312 0          PERIAPO1
0240                       35,2134   77624 1   CALL
0241   REF   1              35,2135   45422 1          SHIFTR1
0242   REF   2  LAST  273   35,2136   16641 0   STODL  POSTTPI
0243   REF   7  LAST  454   35,2137   03663 1          TTPI
0244   REF  17  LAST  453   35,2140   03413 1   STORE  TIG
0245                       35,2141   77776 1   EXIT
0246   REF   1              35,2142   3 3127 0  CAF    V06N58
0247   REF   3  LAST  454   35,2143   0 3114 0  TC     VNPOOH
0248   REF  42  LAST  454   35,2144   0 6006 1  TC     INTPRET
0249                       35,2145   77624 1   CALL
0250   REF   1              35,2146   72742 0          S34/35.5
0251                       35,2147   77624 1   CALL
0252   REF   1              35,2150   73005 0          VN1645
0253                       35,2151   77650 1   GOTO
0254   REF   1              35,2152   72022 1          P34/P74C
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R0255 RENDEZVOUS MID-COURSE MANEUVER PROGRAMS (P35 AND P75)

R0256 MCD NC -1 LOG SECTION - P32-P35, P72-P75
R0257 MCD BY WHITE.P DATE 1JUNE67

R0258 PURPOSE

R0259 (1) TO CALCULATE THE REQUIRED DELTA V AND OTHER INITIAL CONDITIONS
R0260 REQUIRED BY THE ACTIVE VEHICLE FOR EXECUTION OF THE NEXT
R0261 MIDCOURSE CORRECTION OF THE TRANSFER PHASE OF AN ACTIVE
R0262 VEHICLE RENDEZVOUS.

R0263 (2) TO DISPLAY TO THE ASTRONAUT AND THE GROUND CERTAIN DEPENDENT
R0264 VARIABLES ASSOCIATED WITH THE MANEUVER FOR APPROVAL BY THE
R0265 ASTRONAUT/GROUND.

R0266 (3) TO STORE THE TPM TARGET PARAMETERS FOR USE BY THE DESIRED
R0267 THRUSTING PROGRAM.

R0268 ASSUMPTIONS

R0269 (1) THE ISS NEED NOT BE ON TO COMPLETE THIS PROGRAM.

R0270 (2) STATE VECTOR UPDATES BY P27 ARE DISALLOWED DURING AUTOMATIC
R0271 STATE VECTOR UPDATING INITIATED BY P20 (SEE ASSUMPTION (3)).

R0272 (3) THE RENDEZVOUS RADAR IS ON AND IS LOCKED ON THE CSM. THIS WAS
R0273 DONE DURING PREVIOUS SELECTION OF P20. RADAR SIGHTING MARKS
R0274 WILL BE MADE AUTOMATICALLY APPROXIMATELY ONCE A MINUTE WHEN
R0275 ENABLED BY THE TRACK AND UPDATE FLAGS (SEE P20). THE
R0276 RENDEZVOUS TRACKING MARK COUNTER IS ZEROED BY THE SELECTION OF
R0277 P20 AND AFTER EACH THRUSTING MANEUVER.

R0278 (4) THE OPERATION OF THE PROGRAM UTILIZES THE FOLLOWING FLAGS -

R0279 ACTIVE VEHICLE FLAG - DESIGNATES THE VEHICLE WHICH IS
R0280 GOING RENDEZVOUS THRUSTING MANEUVERS TO THE PROGRAM WHICH
R0281 CALCULATES THE MANEUVER PARAMETERS. SET AT THE START OF
R0282 EACH RENDEZVOUS PRE-THRUSTING PROGRAM.

R0283 FINAL FLAG - SELECTS FINAL PROGRAM DISPLAYS AFTER CREW HAS
R0284 SELECTED THE FINAL MANEUVER COMPUTATION CYCLE.

R0285 EXTERNAL DELTA V FLAG - DESIGNATES THE TYPE OF STEERING
R0286 REQUIRED FOR EXECUTION OF THIS MANEUVER BY THE THRUSTING
R0287 PROGRAM SELECTED AFTER COMPLETION OF THIS PROGRAM.

R0288 (5) THE TIME OF INTERCEPT (T(INT)) WAS DEFINED BY PREVIOUS
R0289 COMPLETION OF THE TRANSFER PHASE INITIATION (TPI) PROGRAM
R0290 (P34/P74) AND IS PRESENTLY AVAILABLE IN STORAGE.

R0291 (6) ONCE THE PARAMETERS REQUIRED FOR COMPUTION OF THE MANEUVER
R0292 HAVE BEEN COMPLETELY SPECIFIED, THE VALUE OF THE ACTIVE
R0293 VEHICLE CENTRAL ANGLE OF TRANSFER IS COMPUTED AND STORED.
R0294 THIS NUMBER WILL BE AVAILABLE FOR DISPLAY TO THE ASTRONAUT
R0295 THROUGH THE USE OF V06N52.

R0296 THE ASTRONAUT WILL CALL THIS DISPLAY TO VERIFY THAT THE
R0297 CENTRAL ANGLE OF TRANSFER OF THE ACTIVE VEHICLE IS NOT WITHIN
R0298 170 TO 190 DEGREES. IF THE ANGLE IS WITHIN THIS ZONE THE
R0299 ASTRONAUT SHOULD REASSESS THE INPUT TARGETING PARAMETERS BASED
R0300 UPON DELTA V AND EXPECTED MANEUVER TIME.

R0301 (7) THIS PROGRAM IS SELECTED BY THE ASTRONAUT BY DSKY ENTRY -

R0302 P35 IF THIS VEHICLE IS ACTIVE VEHICLE.

R0303 P75 IF THIS VEHICLE IS PASSIVE VEHICLE.

R0304 INPUT

R0305 (1) TPASS4 TIME OF INTERCEPT - SAVED FROM P34/P74
R0306 OUTPUT

R0307 (1) TRKMKCNT NUMBER OF MARKS
R0308 (2) TTOGO TIME TO GO
R0309 (3) +MGA MIDDLE GIMBAL ANGLE
R0310 (4) DVLOS DELTA VELOCITY AT MID - LINE OF SIGHT
R0311 (5) DELVLVC DELTA VELOCITY AT MID - LOCAL VERTICAL COORDINATES

R0312 DOWNLINK

R0325 (1) TIG TIME OF THE TPM MANEUVER
R0326 (2) DELVEET3 DELTA VELOCITY AT TPM - REFERENCE COORDINATES
R0327 (3) TPASS4 TIME OF INTERCEPT
R0328 COMMUNICATION TO THRUSTING PROGRAMS

R0329 (1) TIG TIME OF THE TPM MANEUVER
R0330 (2) RTARG OFFSET TARGET POSITION
R0331 (3) TPASS4 TIME OF INTERCEPT
R0332 (4) XDELVFLG RESET TO INDICATE LAMBERT (AIMPOINT) VG COMPUTATION

R0333 SUBROUTINES USED

R0334 AVFLAGA
R0335 AVFLAGP
R0336 LOADTIME
R0337 SELECTMU
R0338 PRECSET
R0339 S34/35.1
R0340 S34/35.2

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R0341          S34/35.5
R0342          VN1645

 0343   REF   1                                          COUNT  35/P3575

 0344   REF   6  LAST  201   E4,1763                     EBANK= KT

 0345   REF   2  LAST  453   35,2153   0 3726 1  P35     TC     AVFLAGA
 0346                        35,2154   0 0006 1          EXTEND
 0347   REF   1              35,2155   3 1422 1          DCA    ATIGINC
 0348   REF   1              35,2156   0 2162 C          TC     P35/P75A
 0349   REF   2  LAST  453   35,2157   0 3741 C  P75     TC     AVFLAGP
 0350                        35,2160   0 0006 1          EXTEND
 0351   REF   1              35,2161   3 1424 1          DCA    PTIGINC
 0352   REF   7  LAST  458   35,2162   53'764 1  P35/P75A DXCH   KT
03525   REF   2  LAST  453   35,2163   0 3746 1          TC     P20FLGON      SET UPDATFLG, TRACKFLG
 0353   REF  43  LAST  455   35,2164   0 6006 1          TC     INTPRET
 0359                        35,2165     77624 1         CALL
 0360   REF   2  LAST  453   35,2166     10716 C                 SELECTMU
 0361                        35,2167     77634 0  P35/P75B RTB
 0362   REF   3  LAST  421   35,2170     45505 C                 LOADTIME
03621   REF   3  LAST  122   35,2171     03665 1          STORE  TSTRT
03622                        35,2172     77615 C          DAD
03623   REF   8  LAST  458   35,2173     02364 1                 KT
03624   REF  18  LAST  455   35,2174     03413 1          STORE  TIG
 0363   REF   3  LAST  455   35,2175     03503 1          STORE  INTIME        FOR INITVEL
 0364   REF   5  LAST  454   35,2176     34041 C          STCALL TDEC1
 0365   REF   2  LAST  454   35,2177     45354 1                 PRECSET       ADVANCE BOTH VEHICLES
 0366                        35,2200     77624 1          CALL
 0367   REF   1              35,2201     72522 1                 S34/35.1      GET NORM AND LOS FOR TRANSFORM
 0368                        35,2202     77624 1          CALL
 0369   REF   2  LAST  455   35,2203     72534 C                 S34/35.2      GET DELTA V(LV)
 0370                        35,2204     77624 1          CALL
 0371   REF   2  LAST  455   35,2205     72742 C                 S34/35.5
 0372                        35,2206     77624 1          CALL
 0373   REF   2  LAST  455   35,2207     73005 C                 VN1645
 0379                        35,2210     77650 1          GOTO
 0380   REF   1              35,2211     72167 1                 P35/P75B
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P0381 ..... S33/34.1 .....

0382					35,2212	66220	1	S33/34.1	STQ	SSP
0383	REF	1			35,2213	01340	1			NORMEX
0384	REF	2	LAST	122	35,2214	03665	1			TITER
0385					35,2215	40000	0		OCT	40000
0386					35,2216	40345	1		DLOAD	SETPD
0387	REF	1			35,2217	33136	0			MAX250
0388					35,2220	00001	0			DD
0389	REF	2	LAST	119	35,2221	27454	1		STOVL	SECMAX
0390	REF	4	LAST	459	35,2222	03540	0			RACT3
0391	REF	1			35,2223	27576	0		STOVL	RAPREC
0392	REF	2	LAST	119	35,2224	03546	0			VACT3
0393	REF	1			35,2225	27570	0		STOVL	VAPREC
0394	REF	3	LAST	454	35,2226	03554	0			RPASS3
0395	REF	1			35,2227	27620	0		STOVL	RPPREC
0396	REF	3	LAST	454	35,2230	03562	0			VPASS3
0397	REF	1			35,2231	03612	1		STORE	VPPREC
0398					35,2232	77624	1	ELCALC	CALL	
0399	REF	2	LAST	458	35,2233	72522	1			S34/35.1 NORMAL AND LOS
0400					35,2234	63235	0		VXV	PDVL
0401	REF	5	LAST	459	35,2235	03540	0			RACT3 (RA*VA)*RA CD
0402					35,2236	53515	0		PDVL	UNIT ULOS AT 6D
0403	REF	6	LAST	459	35,2237	03540	0			RACT3
0404					35,2240	46315	1		PDVL	VPROJ XCHNJ AND UP
0405					35,2241	51352	1		VSL2	BVSU
0406	REF	2	LAST	90	35,2242	02625	1			ULOS
0407					35,2243	63256	0		UNIT	PDVL UP AT OD
0408					35,2244	63241	0		DOT	PDVL UP.UN*RA AT OD
0409					35,2245	00001	0			OD UP IN MPAC
0410					35,2246	75241	1		DOT	SIGN
0411	REF	3	LAST	459	35,2247	02625	1			ULOS
0412					35,2250	65552	0		SL1	ACOS
0413					35,2251	50315	0		PDVL	DOT EA AT OD
0414	REF	4	LAST	459	35,2252	02625	1			ULOS
0415	REF	7	LAST	459	35,2253	03540	0			RACT3
0416					35,2254	71244	0		BPL	DLOAD
0417	REF	1			35,2255	72260	0			TESTY
0418	REF	2	LAST	419	35,2256	15340	1			DPPOSMAX
0419					35,2257	41425	1		DSU	PUSH
0420					35,2260	71214	0	TESTY	BOFF	DLOAD
0421	REF	4	LAST	454	35,2261	03741	0			ITSWICH
0422	REF	1			35,2262	72507	0			ELEX
0423	REF	2	LAST	119	35,2263	03452	1			DELEL
0424	REF	1			35,2264	14033	1		STODL	DELELC
0425					35,2265	77625	0		DSU	
0426	REF	6	LAST	453	35,2266	03744	0			ELEV
0427	REF	3	LAST	459	35,2267	03452	1		STORE	DELEL
0428					35,2270	45246	0		ABS	DSU
0429	REF	1			35,2271	33142	0			ELEPS

0430					35,2272	77640	C	BMN	
0431	REF	1			35,2273	72517	1	TIMEX	COMMERCIALS EVERYWHERE
0432					35,2274	70535	C	FIGTIME SLOAD	SR1
0433	REF	3	LAST	459	35,2275	03665	1	TITER	
0434					35,2276	72030	1	BHIZ LXA,1	
0435	REF	2	LAST	459	35,2277	01340	1	NORMEX	TOO MANY ITERATIONS
0436	REF	235	LAST	445	35,2300	00154	1	MPAC	
0437					35,2301	77330	1	SXA,1 VLOAD	
0438	REF	4	LAST	460	35,2302	03664	C	TITER	
0439	REF	4	LAST	459	35,2303	03554	C	RPASS3	
0440					35,2304	65256	C	UNIT PDDL	
0441					35,2305	00045	C	36D	
0442					35,2306	53515	C	PDVL UNIT	
0443	REF	8	LAST	459	35,2307	03540	C	RACT3	
0444					35,2310	77725	1	PDDL	
0445					35,2311	41525	C	PDDL PUSH	
0446					35,2312	00045	C	36D	
0447					35,2313	77621	1	BDSU	
0448					35,2314	00015	C	12D	
0449					35,2315	14037	C	STODL 30D	RP - RA MAGNITUDES
0450	REF	7	LAST	401	35,2316	15330	C	DPHALF	
0451					35,2317	41425	1	DSU PUSH	
0452	REF	7	LAST	459	35,2320	03744	C	ELEV	
0453					35,2321	50165	C	SIGN BMN	
0454					35,2322	00037	C	30D	
0455	REF	3	LAST	460	35,2323	01340	1	NORMEX	
0456					35,2324	71545	C	DLOAD COS	
0457					35,2325	56205	C	DMP DDV	
0458					35,2326	00017	1	14D	
0459					35,2327	00015	C	12D	
0460					35,2330	77676	C	DCOMP	SINCE COS(180-A)=-COS A
0461					35,2331	00035	1	STORE 28D	
0462					35,2332	44246	1	ABS BDSU	
0463	REF	8	LAST	460	35,2333	15330	C	DPHALF	
0464					35,2334	77240	1	BMN VLOAD	
0465	REF	4	LAST	460	35,2335	01340	1	NORMEX	
0466	REF	2	LAST	9C	35,2336	02617	C	UNRM	
0467					35,2337	53435	C	VXV UNIT	
0468					35,2340	00007	C	6D	UN*RA
0469					35,2341	41241	C	DOT DMP	
0470	REF	3	LAST	459	35,2342	03546	C	VACT3	
0471					35,2343	00015	C	12D	
0472					35,2344	47315	C	PDVL VXV	
0473					35,2345	00001	C	0D	
0474	REF	4	LAST	459	35,2346	03562	C	VPASS3	
0475					35,2347	53435	C	VXV UNIT	
0476					35,2350	00001	C	0D	(RP*VP)*RP
0477					35,2351	41241	C	DOT DMP	
0478	REF	5	LAST	460	35,2352	03562	C	VPASS3	
0479					35,2353	00017	1	14D	

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0480                                35,2354  77621 1          BDSU
0481                                35,2355  63301 0          NORM    PDVL            NORMALIZED WA - WP 12D
0482  REF   3  LAST  454            35,2356  00047 1                  X1
0483                                35,2357  00007 0                  6D
0484                                35,2360  50235 0          VXV     DOT
0485                                35,2361  00001 0                  0D
0486  REF   3  LAST  460            35,2362  02617 0                  UNRM            RA*RP.UN 14D
0487                                35,2363  50315 0          PDVL    DOT
0488                                35,2364  00001 0                  0D
0489                                35,2365  00007 0                  6D
0490                                35,2366  65552 0          SL1     ACOS
0491                                35,2367  77765 0          SIGN
0492                                35,2370  43225 0          DSU     DAD              ALPHA   PI
0493  REF   9  LAST  460            35,2371  15330 0                  DPHALF
0494  REF   8  LAST  460            35,2372  03744 0                  ELEV
0495                                35,2373  65525 0          PDDL    ACOS
0496                                35,2374  00035 1                  28D
0497                                35,2375  75221 1          BDSU    SIGN
0498  REF  10  LAST  461            35,2376  15330 0                  DPHALF
0499                                35,2377  00037 0                  30D             CONTAINS RP-RA
0500                                35,2400  77615 0          DAD
0501                                35,2401  56205 0          DMP     DDV
0502  REF   1                       35,2402  33134 1                  TWOPI
0503                                35,2403  77605 1          DMP
0504                                35,2404  41257 1          SL*     DMP
0505                                35,2405  20176 0                  0 -3,1
0506                                35,2406  51406 1          PUSH    ABS
0507                                35,2407  50025 0          DSU     BMN
0508  REF   3  LAST  459            35,2410  03454 1                  SECMAX
0509  REF   1                       35,2411  72415 1                  OKMAX
0510                                35,2412  75345 1          DLOAD   SIGN             REPLACE TIME WITH MAX TIME SIGNED
0511  REF   4  LAST  461            35,2413  03454 1                  SECMAX
0512                                35,2414  77606 1          PUSH
0513                                35,2415  51135 1  OKMAX   SLOAD   BPL              TEST FIRST ITERATION
0514  REF   5  LAST  460            35,2416  03665 1                  TITER
0515  REF   1                       35,2417  72425 1                  REPETE
0516                                35,2420  71331 0          SSP     DLOAD
0517  REF   6  LAST  461            35,2421  03665 1                  TITER
0518                                35,2422  37777 1          OCT     37777
0519                                35,2423  77650 1          GOTO
0520  REF   1                       35,2424  72463 0                  STORDELT
0521                                35,2425  41345 0  REPETE  DLOAD   DMP
0522  REF   4  LAST  459            35,2426  03452 1                  DELEL
0523  REF   2  LAST  459            35,2427  00033 1                  DELELO
0524                                35,2430  71244 0          BPL     DLOAD
0525  REF   1                       35,2431  72441 0                  NEXTES
0526  REF   5  LAST  461            35,2432  03454 1                  SECMAX
0527                                35,2433  77605 1          DMP
0528  REF   1                       35,2434  33140 1                  THIRD
0529  REF   6  LAST  461            35,2435  17454 1          STODL   SECMAX
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0530                                35,2436  70446 C            ABS     SR1          CROSSED OVER SOLUTION
0531                                35,2437  52076 1            DCOMP   GOTO         DT=(-SIGN(DTO)//DT//)/2
0532  REF   1                      35,2440  72451 1                    RESIGN
0533                                35,2441  51545 1  NEXTES    DLOAD   ABS
0534  REF   5  LAST  461           35,2442  03452 1                    DELEL
0535                                35,2443  51525 1            PDDL    ABS
0536  REF   3  LAST  461           35,2444  00033 1                    DELELO
0537                                35,2445  77625 C            DSU
0538                                35,2446  71240 1            BMN     DLOAD
0539  REF   1                      35,2447  72454 1                    REVERS       WRONG DIRECTION
0540                                35,2450  77646 C            ABS
0541                                35,2451  52165 1  RESIGN    SIGN    GOTO
0542  REF   2  LAST  119           35,2452  03450 C                    DELTEEO
0543  REF   2  LAST  461           35,2453  72463 C                    STORDELT
0544                                35,2454  57545 1  REVERS    DLOAD   DCOMP
0545  REF   3  LAST  462           35,2455  03450 C                    DELTEEO
0546                                35,2456  70406 1            PUSH    SR1
0547  REF   4  LAST  462           35,2457  03450 C            STORE   DELTEEO
0548                                35,2460  77615 C            DAD
0549                                35,2461  77650 1            GOTO
0550  REF   1                      35,2462  72464 1                    ADTIME
0551  REF   5  LAST  462           35,2463  03450 C  STORDELT  STORE   DELTEEO
0552                                35,2464  77615 C  ADTIME    DAD
0553  REF   3  LAST  454           35,2465  02364 1                    NOMTPI       SUM OF DELTA T:S
0554  REF   4  LAST  462           35,2466  02364 1            STORE   NOMTPI
0555                                35,2467  63375 C            VLOAD   PDVL
0556  REF   2  LAST  459           35,2470  03570 C                    VAPREC
0557  REF   2  LAST  459           35,2471  03576 C                    RAPREC
0558                                35,2472  77624 1            CALL
0559  REF   1                      35,2473  72702 1                    GOINT
0560                                35,2474  77624 1            CALL
0561  REF   1                      35,2475  45376 1                    ACTIVE       STORE NEW RACT3 VACT3
0562                                35,2476  63375 C            VLOAD   PDVL
0563  REF   2  LAST  459           35,2477  03612 1                    VPPREC
0564  REF   2  LAST  459           35,2500  03620 C                    RPPREC
0565                                35,2501  77624 1            CALL
0566  REF   2  LAST  462           35,2502  72702 1                    GOINT
0567                                35,2503  77624 1            CALL
0568  REF   1                      35,2504  45406 1                    PASSIVE      STORE NEW RPASS3 VPASS3
0569                                35,2505  77650 1            GOTO
0570  REF   1                      35,2506  72232 1                    ELCALC
0571                                35,2507  43345 1  ELEX      DLOAD   DAD
0572  REF   8  LAST  455           35,2510  03663 1                    TTPI
0573  REF   5  LAST  462           35,2511  02364 1                    NOMTPI
0574  REF   9  LAST  462           35,2512  17663 1            STODL   TTPI
0575                                35,2513  77614 1            BON
0576  REF   7  LAST  454           35,2514  01310 1                    ETPIFLAG
0577  REF   2  LAST  460           35,2515  72517 1                    TIMEX
0578  REF   9  LAST  461           35,2516  03744 C            STORE   ELEV
0579                                35,2517  52145 C  TIMEX     DLOAD   GOTO
```

```
0580   REF   3  LAST  453   35,2520   15332 1          ZEROVECS
0581   REF   5  LAST  460   35,2521   01340 1          NORMEX
```

```
R0582   ..... S34/35.1  .....

R0583   COMPUTE UNIT NORMAL AND LINE OF SIGHT VECTORS GIVEN THE ACTIVE AND
R0584   PASSIVE POS AND VEL AT TIME T3
 0585                              35,2522   52375 1  S34/35.1 VLOAD  VSU
 0586   REF    5  LAST  46C       35,2523   03554 0                   RPASS3
 0587   REF    9  LAST  46C       35,2524   03540 0                   RACT3
 0588                              35,2525   41456 0           UNIT    PUSH
 0589   REF    5  LAST  459       35,2526   26625 1           STOVL   ULOS
 0590   REF   10  LAST  464       35,2527   03540 0                   RACT3
 0591                              35,2530   53435 0           VXV     UNIT
 0592   REF    4  LAST  46C       35,2531   03546 0                   VACT3
 0593   REF    4  LAST  461       35,2532   02617 0           STORE   UNRM
 0594                              35,2533   77616 0           RVQ
```

```
P0595   ..... S34/35.2  .....

R0596   ADVANCE PASSIVE VEH TO RENDEZVOUS TIME AND GET REQ VEL FROM LAMBERT
 0597                           35,2534   77220 1  S34/35.2 STQ    VLOAD
 0598   REF   6  LAST  453     35,2535   02370 1                   SUBEXIT
 0599   REF   6  LAST  460     35,2536   03562 0                   VPASS3
 0600                           35,2537   65315 0           PDVL    PDDL
 0601   REF   6  LAST  464     35,2540   03554 0                   RPASS3
 0602   REF   4  LAST  458     35,2541   03503 1                   INTIME
 0603                           35,2542   65325 0           PDDL    PDDL
 0604   REF   5  LAST  455     35,2543   03656 1                   TPASS4
 0605   REF   4  LAST  463     35,2544   15332 1                   ZEROVECS
 0606                           35,2545   45006 0           PUSH    CALL
 0607   REF   1                35,2546   72706 0                   INTINT          GET TARGET VECTOR
 0608   REF   4  LAST  170     35,2547   27415 1  S3435.25 STOVL   RTARG
 0609   REF   1                35,2550   00007 0                   VATT
 0610   REF   3  LAST  455     35,2551   27640 0           STOVL   VPASS4
 0611   REF   5  LAST  465     35,2552   03415 1                   RTARG
R0612   COMPUTE PHI = PI +(ACOS(UNIT RA.UNIT RP)-PI)SIGN(RA*RP.U)
 0613                           35,2553   63256 0           UNIT    PDVL            UNIT RP
 0614   REF  11  LAST  464     35,2554   03540 0                   RACT3
 0615                           35,2555   41456 0           UNIT    PUSH            UNIT RA
 0616                           35,2556   50235 0           VXV     DOT
 0617                           35,2557   00001 0                   OD
 0618   REF   5  LAST  464     35,2560   02617 0                   UNRM            RA*RP.U
 0619                           35,2561   77715 1           PDVL
 0620                           35,2562   72441 0           DOT     SL1             UNIT RA.UNIT RP
 0621                           35,2563   00001 0                   OD
 0622                           35,2564   75326 1           ACOS    SIGN
 0623                           35,2565   43244 1           BPL     DAD
 0624   REF   1                35,2566   72570 0                   NOPIE
 0625   REF   3  LAST  459     35,2567   15340 1                   DPPOSMAX        REASONABLE TWO PI
 0626   REF   3  LAST  273     35,2570   16633 0  NOPIE    STODL   ACTCENT
 0627   REF   6  LAST  465     35,2571   03656 1                   TPASS4
 0628                           35,2572   77625 0           DSU
 0629   REF   5  LAST  465     35,2573   03503 1                   INTIME
 0630   REF   4  LAST  170     35,2574   03423 1           STORE   DELLT4
 0631                           35,2575   40335 0           SLOAD   SETPD
 0632   REF   1                35,2576   33144 0                   DECTWO
 0633                           35,2577   00001 0                   OD
06331                           35,2600   63325 0           PDDL    PDVL
06332   REF   1                35,2601   33147 0                   EPSFCUR
06333   REF  12  LAST  465     35,2602   03540 0                   RACT3
06334   REF   3  LAST  120     35,2603   27570 0           STOVL   RINIT
06335   REF   5  LAST  464     35,2604   03546 0                   VACT3
06336   REF   3  LAST  120     35,2605   37576 1           STCALL  VINIT
06337   REF   1                35,2606   22000 1                   INITVEL
 0634                           35,2607   77624 1           CALL
 0635   REF   1                35,2610   72667 0                   LOMAT
 0636                           35,2611   64375 1           VLOAD   MXV
```

```
0637   REF   5  LAST  455    35,2612   03646 C                DELVEET3
0638                         35,2613   00001 C                OD
0639                         35,2614   77772 C          VSL1
0640   REF   7  LAST  275    35,2615   37405 1          STCALL DELVLVC
0641   REF   7  LAST  465    35,2616   02370 1                 SUBEXIT
```

P0642 ..... S34/35.3 .....

```
0643                          35,2617  45020 1  S34/35.3 STQ     CALL
0644  REF   6  LAST  463      35,2620  01340 1                    NORMEX
0645  REF   2  LAST  465      35,2621  72667 0                    LOMAT      GET MATRIX IN PUSH LIST
0646                          35,2622  61375 1           VLOAD    VXM
0647  REF   8  LAST  466      35,2623  03405 0                    DELVLVC    NEW DEL V TPI
0648                          35,2624  00001 0                    OD
0649                          35,2625  77772 0           VSL1
0650  REF   6  LAST  466      35,2626  03646 0           STORE    DELVEET3   SAVE FOR TRANSFORM
0651                          35,2627  63255 0           VAD      PDVL
0652  REF   6  LAST  465      35,2630  03546 0                    VACT3      NEW V REQ
0653  REF  13  LAST  465      35,2631  03540 0                    RACT3
0654                          35,2632  65325 0           PDDL     PDDL
0655  REF  19  LAST  45E      35,2633  03413 1                    TIG
0656  REF   7  LAST  465      35,2634  03656 1                    TPASS4
0657                          35,2635  41525 0           PDDL     PUSH
0658  REF   4  LAST  465      35,2636  15340 1                    DPPOSMAX
0659                          35,2637  77624 1           CALL                INTEG. FOR NEW TARGET VEC
0660  REF   2  LAST  465      35,2640  72706 0                    INTINT
0661                          35,2641  77775 1           VLOAD
0662  REF   3  LAST  449      35,2642  00001 0                    RATT
0663  REF   6  LAST  465      35,2643  03415 1           STORE    RTARG
0664                          35,2644  41575 0  NOVRHRT  VLOAD    PUSH
0665  REF   6  LAST  464      35,2645  02625 1                    ULOS
0666                          35,2646  57435 1           VXV      VCOMP
0667  REF   6  LAST  465      35,2647  02617 0                    UNRM
0668                          35,2650  41456 0           UNIT     PUSH
0669                          35,2651  76435 1           VXV      VSL1
0670  REF   7  LAST  467      35,2652  02625 1                    ULOS
0671                          35,2653  77715 1           PDVL
0672                          35,2654  64315 1           PDVL     MXV
0673  REF   7  LAST  467      35,2655  03646 0                    DELVEET3
0674                          35,2656  00001 0                    OD
0675                          35,2657  77772 0           VSL1
0676  REF  10  LAST  273      35,2660  36611 1           STCALL   DVLOS
0677  REF   7  LAST  467      35,2661  01340 1                    NORMEX
```

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P0678 ..... S34/35.4 .....

```
0679                          35,2662   40220 0  S34/35.4 STQ    SETPD          NO ASTRONAUT OVERWRITE
0680  REF   8  LAST  467      35,2663   01340 1                   NORMEX
0681                          35,2664   00001 0                   OD
0682                          35,2665   77650 1            GOTO
0683  REF   1                 35,2666   72644 1                   NOVRWRT
```

P0684 ..... LCMAT .....

```
0685                          35,2667  57575 1  LCMAT    VLOAD  VCOMP
0686  REF   7  LAST  467      35,2670  02617 0           UNRM
0687                          35,2671  24007 0           STOVL  6D              Y
0688  REF  14  LAST  467      35,2672  03540 0           RACT3
0689                          35,2673  57456 1           UNIT   VCOMP
0690                          35,2674  00015 0           STORE  12D
0691                          35,2675  76435 1           VXV    VSL1
0692  REF   8  LAST  469      35,2676  02617 0           UNRM   Z*-Y
0693                          35,2677  00001 0           STORE  0D
0694                          35,2700  43401 0           SETPD  RVQ
0695                          35,2701  00023 0                  18D
0696                          35,2702  65325 0  GOINT    PDDL   PDDL            DO
0697  REF   5  LAST  465      35,2703  15332 1                  ZEROVECS          NOT
0698  REF   6  LAST  462      35,2704  02364 1                  NORMTPI
0699                          35,2705  41406 0           PUSH   PUSH                    ORDER OR INSERT BEFORE INTINT
0700                          35,2706  45020 1  INTINT   STQ    CALL
0701  REF   2  LAST   89      35,2707  02367 1                  RTRN
0702  REF   6  LAST  258      35,2710  27371 1                  INTSTALL
0703                          35,2711  71214 0           CLEAR  DLOAD
0704  REF   1                 35,2712  01673 1                  INTYPFLG
0705                          35,2713  43054 1           BZE    SET
0706                          35,2714  72716 1                  +2
0707  REF   2  LAST  469      35,2715  01473 0                  INTYPFLG
0708                          35,2716  45545 1           DLOAD  STADR
0709  REF   6  LAST  458      35,2717  63736 0           STODL  TDEC1
0710                          35,2720  73014 0           SET    LXA,2
0711  REF   1                 35,2721  00063 1                  MOONFLAG
0712  REF   2  LAST  123      35,2722  03746 1                  RTX2
0713                          35,2723  43014 0           BON    CLEAR
0714  REF   2  LAST   32      35,2724  04303 0                  CMOONFLG
0715  REF   1                 35,2725  72727 0                  ALLSET
0716  REF   2  LAST  469      35,2726  00263 0                  MOONFLAG
0717  REF   4  LAST  282      35,2727  25517 0  ALLSET   STOVL  TET
0718                          35,2730  77657 0           VSR*
0719                          35,2731  57176 0                  0,2
0720  REF   4  LAST  282      35,2732  25535 0           STOVL  RCV
0721                          35,2733  77657 0           VSR*
0722                          35,2734  57176 0                  0,2
0723  REF   4  LAST  283      35,2735  35543 0           STCALL VCV
0724  REF   1                 35,2736  27066 1                  INTEGRVS
0725                          35,2737  52175 0           VLOAD  GOTO
0726  REF   4  LAST  467      35,2740  00001 0                  RATT
0727  REF   3  LAST  469      35,2741  02367 1                  RTRN
```

P0728 ..... S34/35.5 .....
R0729 SUBROUTINES USED

R0730 BANKCALL
R0731 GOFLASH
R0732 GOTOPOOH
R0733 S34/35.3
R0734 S34/35.4
R0735 VNPOOH

```
0736                                35,2742   43020 1  S34/35.5 STQ     BON
0737  REF   8  LAST  466            35,2743   02370 1                    SUBEXIT
0738  REF   1                       35,2744   01311 0                    FINALFLG
0739  REF   1                       35,2745   72751 1                    FLAGON
0740                                35,2746   52014 0           SET      GOTO
0741  REF   2  LAST  252            35,2747   00470 1                    UPDATFLG
0742  REF   1                       35,2750   72775 1                    FLAGOFF
0743                                35,2751   77414 0  FLAGON   CLEAR    EXIT
0744  REF   1                       35,2752   03274 0                    NTARGFLG
0745  REF   1                       35,2753   3 3131 1          CAF      V06N81
0746  REF  88  LAST  454            35,2754   0 4555 0          TC       BANKCALL
0747  REF  11  LAST  454            35,2755    20624 0          CADR     GOFLASH
0748  REF   8  LAST  454            35,2756   0 4106 1          TC       GOTOPOOH
0749                                35,2757   0 2764 0          TC       +5
0750  REF  44  LAST  458            35,2760   0 6006 1          TC       INTPRET
0751                                35,2761    77414 0          SET      EXIT
0752  REF   2  LAST  47C            35,2762    03074 1                    NTARGFLG
0753  REF   2  LAST  47C            35,2763   0 2753 1          TC       FLAGON +2
0754  REF  45  LAST  47C            35,2764   0 6006 1          TC       INTPRET
0755                                35,2765    45014 0          BOFF     CALL
0756  REF   3  LAST  47C            35,2766    03354 0                    NTARGFLG
0757  REF   1                       35,2767    72771 0                    NOCHG
0758  REF   1                       35,2770    72617 1                    S34/35.3
0759                                35,2771    77214 0  NOCHG    CLEAR    VLOAD
0760  REF   1                       35,2772    01267 0                    XDELVFLG
0761  REF   8  LAST  467            35,2773    03646 0                    DELVEET3
0762  REF   3  LAST  12C            35,2774    03646 0           STORE    DELVSIN
0763                                35,2775    77624 1  FLAGOFF  CALL
0764  REF   1                       35,2776    72662 0                    S34/35.4
0765                                35,2777    77776 1           EXIT
0766  REF   1                       35,3000   3 3130 0          CAF      V06N59
0767  REF   4  LAST  455            35,3001   0 3114 0          TC       VNPOOH
0768  REF  46  LAST  47C            35,3002   0 6006 1          TC       INTPRET
0769                                35,3003    77650 1          GOTO
0770  REF   9  LAST  47C            35,3004    02370 1                    SUBEXIT
```

```
P0771   ..... VN1645    .....

R0772   SUBROUTINES USED

R0773           P3XORP7X
R0774           GET+MGA
R0775           BANKCALL
R0776           DELAYJOB
R0777           COMPTGO
R0778           GOFLASHR
R0779           GOTOPOOH
R0780           FLAGUP

 0781                                35,3005   71220 1  VN1645   STQ     DLOAD
 0782   REF  10  LAST  470           35,3006   02370 1                   SUBEXIT
 0783   REF   1                     35,3007   33145 1                   DP-.01
 0784   REF   4  LAST  272          35,3010   03626 0           STORE   +MGA           MGA = -.01
 0785                               35,3011   71214 0           BOFF    DLOAD
 0786   REF   2  LAST  470          35,3012   01351 1                   FINALFLG
 0787   REF   1                     35,3013   73033 0                   GET45
 0788   REF   2  LAST  471          35,3014   33145 1                   DP-.01
 0789                               35,3015   77615 0           DAD
 0790   REF   3  LAST  471          35,3016   33145 1                   DP-.01
 0791   REF   5  LAST  471          35,3017   03626 0           STORE   +MGA           MGA = -.02
 0792                               35,3020   77414 0           BOFF    EXIT
 0793   REF   1                     35,3021   01742 1                   REFSMFLG
 0794   REF   2  LAST  471          35,3022   73033 0                   GET45
 0795   REF   1                     35,3023   0 3106 0          TC      P3XORP7X
 0796                               35,3024   0 3026 0          TC      +2            P3X
 0797   REF   3  LAST  471          35,3025   0 3034 0          TC      GET45 +1      P7X
 0798   REF  47  LAST  470          35,3026   0 6006 1          TC      INTPRET
 0799                               35,3027    41575 0          VLOAD   PUSH
 0800   REF   4  LAST  470          35,3030    03646 0                  DELVSIN
 0801                               35,3031    77624 1          CALL                  COMPUTE MGA
 0802   REF   1                     35,3032    10660 0                  GET+MGA
 0803                               35,3033    77776 1  GET45   EXIT
 0804   REF   1                     35,3034   0 3564 0          TC      COMPTGO       INITIATE TASK TO UPDATE TTOGO
 0805   REF  11  LAST  471          35,3035   3 1770 0          CA      SUBEXIT
 0806   REF   2  LAST   89          35,3036   55*766 0          TS      QSAVED
 0807   REF   2  LAST  422          35,3037   3 4734 0          CAF     1SEC
 0808   REF  89  LAST  470          35,3040   0 4555 0          TC      BANKCALL
 0809   REF   2  LAST  193          35,3041    01730 1          CADR    DELAYJOB
 0810   REF   1                     35,3042   3 3132 1          CAF     V16N45        TRKMKCNT, TTOGO, +MGA
 0811   REF  90  LAST  471          35,3043   0 4555 0          TC      BANKCALL
 0812   REF  12  LAST  470          35,3044    20624 0          CADR    GOFLASH
 0813   REF   1                     35,3045   0 3050 1          TC      KILCLOCK      TERMINATE
 0814   REF   1                     35,3046   0 3053 1          TC      N45PROC       PROCEED
 0815   REF   1                     35,3047   0 3063 1          TC      CLUPDATE      RECYCLE - RETURN FOR INITIAL COMPUTATION
 0816   REF  13  LAST  340          35,3050   3 0005 1  KILCLOCK CA      Z
 0817   REF   1                     35,3051   54 000 0          TS      DISPDEX
```

```
0818  REF   9  LAST  470   35,3052  0 4106 1          TC      GOTOPOOH
0819  REF   7  LAST  297   35,3053  4 0076 1 N45PROC  CS      FLAGWRD2
0820  REF  31  LAST  381   35,3054  7 4705 0          MASK    BIT6
0821                       35,3055  0 0006 1          EXTEND
0822  REF   2  LAST  471   35,3056  1 3050 0          BZF     KILCLOCK      FINALFLG IS SET-FLASH V37-AWAIT NEW PGM
0823  REF  20  LAST  445   35,3057  0 5301 0          TC      PHASCHNG
0824                       35,3060    04024 0        OCT     04024
0825  REF  16  LAST  389   35,3061  0 5435 0          TC      UPFLAG        SET
0826  REF   3  LAST  471   35,3062    00047 1         ADRES   FINALFLG      FINALFLG
0827  REF  14  LAST  471   35,3063  3 0005 1 CLUPDATE CA      Z
0828  REF   2  LAST  471   35,3064  54 000 0          TS      DISPDEX
0829  REF  21  LAST  472   35,3065  0 5301 0          TC      PHASCHNG
0830                       35,3066    04024 0        OCT     04024
0831  REF  48  LAST  471   35,3067  0 6006 1          TC      INTPRET
0832                       35,3070    52014 0        CLEAR   GOTO
0833  REF   3  LAST  470   35,3071    00670 0                  UPDATFLG
0834  REF   3  LAST  471   35,3072    02366 0                  QSAVED
```

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PQ835   ..... DISPLAYE .....

RQ836   SUBROUTINES USED

RQ837           BANKCALL
RQ838           GOFLASHR
RQ839           GOTOPOOH
RQ840           BLANKET
RQ841           ENDOFJOB

 0842                                35,3073   0 0006 1  DISPLAYE EXTEND
 0843   REF   9  LAST  468           35,3074  23*340 1                QXCH    NORMEX
 0844   REF   1                      35,3075   3 3126 1                CAF     V06N55
 0845   REF  91  LAST  471           35,3076   0 4555 0                TCR     BANKCALL
 0846   REF   1                      35,3077    20763 1                CADR    GOFLASHR
 0847   REF  10  LAST  472           35,3100   1 4106 0                TCF     GOTOPOOH
 0848   REF  10  LAST  473           35,3101   0 1340 1                TC      NORMEX
 0849                                35,3102   1 3075 1                TCF     -5
 0850   REF  36  LAST  440           35,3103   3 4712 1                CAF     BIT1            BLANK R1
 0851   REF   1                      35,3104   0 5415 1                TCR     BLANKET
 0852   REF  57  LAST  442           35,3105   1 5112 1                TCF     ENDOFJOB
```

```
R0853   ..... P3XCRP7X .....

 0854   REF    1               35,3106  3 7713 C  P3XCRP7X CAF    HIGH9
 0855   REF    8  LAST  383    35,3107  7 1011 1           MASK   MODREG
 0856                          35,3110  0 0006 1           EXTEND
 0857                          35,3111  1 3113 C           BZF    +2
 0858   REF  151  LAST  437    35,3112  24 002 C           INCR   Q
 0859                          35,3113  0 0002 C           RETURN

R0860   ..... VNPOOH    .....

R0861   SUBROUTINES USED

R0862           BANKCALL
R0863           GOFLASH
R0864           GOTOPOOH

 0865                          35,3114  0 0006 1  VNPOOH   EXTEND
 0866   REF    4  LAST  469    35,3115  23'767 C           QXCH   RTRN
 0867   REF    2  LAST   88    35,3116  55'765 C           TS     VERBNOUN
 0868   REF    3  LAST  474    35,3117  3 1765 1           CA     VERBNOUN
 0869   REF   92  LAST  473    35,3120  0 4555 0           TCR    BANKCALL
 0870   REF   13  LAST  471    35,3121   20624 C           CADR   GOFLASH
 0871   REF   11  LAST  473    35,3122  1 4106 C           TCF    GOTOPOOH
 0872   REF    5  LAST  474    35,3123  0 1767 C           TC     RTRN
 0873                          35,3124  1 3117 1           TCF    -5
```

PC874 ..... CONSTANTS .....

```
0875                    35,3125   01445 0   V06N37   VN     0637
0876                    35,3126   01467 0   V06N55   VN     0655
0877                    35,3127   01472 1   V06N58   VN     0658
0878                    35,3130   01473 0   V06N59   VN     0659
0879                    35,3131   01521 0   V06N81   VN     0681
0880                    35,3132   04055 0   V16N45   VN     1645
0881                    35,3133   14441 0   TWOPI    2DEC   6.283185307 B-4
0881                    35,3134   37325 1
0882                    35,3135   00001 0   MAX25O   2DEC   25 E3
0882                    35,3136   20650 0
0883                    35,3137   12525 0   THIRD    2DEC   .333333333
0883                    35,3140   12525 0
0884                    35,3141   00004 0   ELEPS    2DEC   .27777777 E-3
0884                    35,3142   21505 1
0885                    35,3143   00002 0   DECTWO   OCT    2
0886                    35,3144   77777 0   DP-.01   OCT    77777          CONSTANTS
0887                    35,3145   61337 1             OCT    61337          ADJACENT      -.01 FOR MGA DSP
08871                   35,3146   01252 0   EPSFOUR  2DEC   .0416666666
08871                   35,3147   25253 1
```

```
PC888   ..... INITVEL .....

R0889   MCC NC -1       LCC SECTION - P34-P35, P74-P75
R0890   MCC BY WHITE.P  DATE  21NOV67

R0891   FUNCTIONAL DESCRIPTION

R0892           THIS SUBROUTINE COMPUTES THE REQUIRED INITIAL VELOCITY VECTOR FOR
R0893           A TRAJECTORY OF SPECIFIED TRANSFER TIME BETWEEN SPECIFIED INITIAL
R0894           AND TARGET POSITIONS.  THE TRAJECTORY MAY BE EITHER CONIC OR
R0895           PRECISION DEPENDING ON AN INPUT PARAMETER (NAMELY, NUMBER OF
R0896           OFFSETS).  IN ADDITION, IN THE PRECISION TRAJECTORY CASE, THE
R0897           SUBROUTINE ALSO COMPUTES AN OFFSET TARGET VECTOR, TO BE USED
R0898           DURING PURE-CONIC CROSS-PRODUCT STEERING.  THE OFFSET TARGET
R0899           VECTOR IS THE TERMINAL POSITION VECTOR OF A CONIC TRAJECTORY WHICH
R0900           HAS THE SAME INITIAL STATE AS A PRECISION TRAJECTORY WHOSE
R0901           TERMINAL POSITION VECTOR IS THE SPECIFIED TARGET VECTOR.

R0902           IN ORDER TO AVOID THE INHERENT SINGULARITIES IN THE 180 DEGREE
R0903           TRANSFER CASE WHEN THE (TRUE OR OFFSET) TARGET VECTOR MAY BE
R0904           SLIGHTLY OUT OF THE ORBITAL PLANE, THIS SUBROUTINE ROTATES THIS
R0905           VECTOR INTO A PLANE DEFINED BY THE INPUT INITIAL POSITION VECTOR
R0906           AND ANOTHER INPUT VECTOR (USUALLY THE INITIAL VELOCITY VECTOR),
R0907           WHENEVER THE INPUT TARGET VECTOR LIES INSIDE A CONE WHOSE VERTEX
R0908           IS THE ORIGIN OF COORDINATES, WHOSE AXIS IS THE 180 DEGREE
R0909           TRANSFER DIRECTION, AND WHOSE CONE ANGLE IS SPECIFIED BY THE USER.

R0910           THE LAMBERT SUBROUTINE IS UTILIZED FOR THE CONIC COMPUTATIONS AND
R0911           THE COASTING INTEGRATION SUBROUTINE IS UTILIZED FOR THE PRECISION
R0912           TRAJECTORY COMPUTATIONS.

R0913   CALLING SEQUENCE

R0914           L         CALL
R0915           L+1               INITVEL
R0916           L+2       (RETURN - ALWAYS)

R0917   INFLT

R0918           (1) RINIT     INITIAL POSITION RADIUS VECTOR
R0919           (2) VINIT     INITIAL POSITION VELOCITY VECTOR
R0920           (3) RTARG     TARGET POSITION RADIUS VECTOR
R0921           (4) DELLT4    DESIRED TIME OF FLIGHT FROM RINIT TO RTARG
R0922           (5) INTIME    TIME OF RINIT
R0923           (6) CD        NUMBER OF ITERATIONS OF LAMBERT/INTEGRVS
R0924           (7) 2D        ANGLE TO 180 DEGREES WHEN ROTATION STARTS
R0925           (8) RTX1      -2 FOR EARTH, -100 FOR LUNAR
R09251          (9) RTX2      COORDINATE SYSTEM ORIGIN - 0 FOR EARTH, 2 FOR LUNAR
R0926           PUSHLOC SET AT 4D
```

L P34-P35, P74-P75 USER'S PAGE NO. 28 E4 S3

R0927 CLTPLT

R0928 (1) RTARG OFFSET TARGET POSITION VECTOR
R0929 (2) VIPRIME MANEUVER VELOCITY REQUIRED
R0930 (3) VTPRIME VELOCITY AT TARGET AFTER MANEUVER
R0931 (4) DELVEET3 DELTA VELOCITY REQUIRED FOR MANEUVER

R0932 SUBROUTINES USED

R0933 LAMBERT
R0934 INTSTALL
R0935 INTEGRVS

```
 0936  REF   1                  11,2000                    SETLOC  INTVEL
 0937                           11,2000                    BANK

 0938  REF   1                                             COUNT   11/INITV

 0958                           11,2000   77614 1  INITVEL  SET                    COGA GUESS NOT AVAILABLE
 0959  REF   1                  11,2001   00475 1                   GUESSW
 0960                           11,2002   44175 1  HAVEGUES VLOAD   STQ
 0961  REF   7  LAST  467       11,2003   03415 1                   RTARG
 0962  REF  11  LAST  473       11,2004   01340 1                   NORMEX
 0963  REF   2  LAST  119       11,2005   03604 0          STORE    RTARG1
 0964                           11,2006   46135 1          SLOAD    BHIZ
 0965  REF   3  LAST  469       11,2007   03747 0                   RTX2
 0967  REF   1                  11,2010   22022 1                   INITVEL1
 0968                           11,2011   72575 0          VLOAD    VSL2
 0969  REF   4  LAST  465       11,2012   03570 0                   RINIT           B29
 0970  REF   5  LAST  477       11,2013   27570 0          STOVL    RINIT           B27
 0971  REF   4  LAST  465       11,2014   03576 0                   VINIT           B7
 0972                           11,2015   77752 1          VSL2
 0973  REF   5  LAST  477       11,2016   27576 0          STOVL    VINIT           B5
 0974  REF   3  LAST  477       11,2017   03604 0                   RTARG1
 0975                           11,2020   77752 1          VSL2
 0976  REF   4  LAST  477       11,2021   03604 0          STORE    RTARG1
```

R0977 INITIALIZATION

```
 0978                           11,2022   71331 0  INITVEL1 SSP     DLOAD           SET ITCTR TO -1,LOAD MPAC WITH E4(PL 20)
 0979  REF   1                  11,2023   03505 1                   ITCTR
 0980                           11,2024   77776 1                   0 -1
 0981                           11,2025   70546 1          COSINE   SR1             CALCULATE COSINE (E4)  (+2)
 0982  REF   2  LAST  120       11,2026   17630 1          STODL    COZY4           SET COZY4 TO COSINE(E4)          (PL 0D)
 0983                           11,2027   67154 0          LXA,2    SXA,2
 0984  REF 236  LAST  460       11,2030   00154 1                   MPAC
 0985  REF   2  LAST   93       11,2031   02703 1                   VTARGTAG        SET VTARGTAG TO 0D (SP)
 0986                           11,2032   77775 1          VLOAD
 0987  REF   6  LAST  477       11,2033   03570 0                   RINIT
 0988  REF   3  LAST   93       11,2034   26657 1          STOVL    RIVEC           RIVEC EQ RINIT
 0989  REF   5  LAST  477       11,2035   03604 0                   RTARG1
```

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 0990   REF  2  LAST   93   11,2036   16665 C            STODL   R2VEC          R2VEC EQ RTARG
 0991   REF  5  LAST  465   11,2037   03423 1                    DELLT4
 0992   REF  2  LAST   93   11,2040   02673 1            STORE   TDESIRED       TDESIRED EQ DELLT4
 0993                       11,2041   77201 1            SETPD   VLOAD
 0994                       11,2042   00001 0                    0D             INITIALIZE PL TO 0D
 0995   REF  7  LAST  477   11,2043   03570 0                    RINIT          MPAC EQ RINIT (+29)
 0996                       11,2044   41456 0            UNIT    PUSH           UNIT(RI)  (+1)                  (PL 6D)
 0997                       11,2045   53435 0            VXV     UNIT
 0998   REF  6  LAST  477   11,2046   03576 0                    VINIT          MPAC EQ UNIT(RI) X VI   (+8)
 0999   REF  2  LAST   93   11,2047   26676 1            STOVL   UN
 1000   REF  6  LAST  477   11,2050   03604 0                    RTARG1
 1001                       11,2051   50256 0            UNIT    DOT            TEMP=URT.URI  (+2)               (PL 0D)
 1002                       11,2052   43015 1            DAD     CLEAR
 1003   REF  3  LAST  477   11,2053   03630 1                    COZY4
 1004   REF  1               11,2054   03665 1                    NORMSW
 1005   REF  4  LAST  478   11,2055   03630 1            STORE   COZY4
 1006                       11,2056   43044 0  INITVEL2  BPL     SET
 1007   REF  1               11,2057   22101 1                    INITVEL3       UN CALCULATED IN LAMBERT
 1008   REF  2  LAST  478   11,2060   03465 0                    NORMSW
R1009      ROTATE  RC INTO YC PLANE - SET UNIT NORMAL TO YC

 1010                       11,2061   41575 0            VLOAD   PUSH                                           (PL 6D)
 1011   REF  3  LAST  478   11,2062   02665 0                    R2VEC          RC TO 6D  (+29)
 1012                       11,2063   63246 1            ABVAL   PDVL           RC TO MPAC, ABVAL(RC) (+29) TO 0D(PL 2D)
 1013                       11,2064   46206 1            PUSH    VPROJ                                          (PL 8D)
 1014   REF  3  LAST  478   11,2065   02676 1                    UN
 1015                       11,2066   51352 1            VSL2    BVSU
 1016                       11,2067   74256 0            UNIT    VXSC                                           (PL 0D)
 1017                       11,2070   77772 0            VSL1
 1018   REF  4  LAST  478   11,2071   02665 0            STORE   R2VEC
 1019                       11,2072   67351 1            TLOAD   SLOAD
 1020   REF  2  LAST   31   11,2073   11453 0                    ZEROVEC
 1021   REF  2  LAST  477   11,2074   03505 1                    ITCTR
 1022                       11,2075   77244 0            BPL     VLOAD
 1023   REF  2  LAST  478   11,2076   22101 1                    INITVEL3
 1024   REF  5  LAST  478   11,2077   02665 0                    R2VEC
 1025   REF  7  LAST  478   11,2100   03604 0            STORE   RTARG1
 1026                       11,2101   63345 0  INITVEL3  DLOAD   PDVL                                           (PL 2D)
 1027   REF  1               11,2102   27733 0                    MUEARTH        POSITIVE VALUE
 1028   REF  6  LAST  478   11,2103   02665 0                    R2VEC
 102802                     11,2104   63256 0            UNIT    PDVL           2D = UNIT(R2VEC)                (PL 8D)
 102804 REF  4  LAST  477   11,2105   02657 1                    R1VEC
 102806                     11,2106   41456 0            UNIT    PUSH           8D = UNIT(R1VEC)                (PL14D)
 102808                     11,2107   57435 1            VXV     VCOMP          -N = UNIT(R2VEC) X UNIT(R1VEC)
 10281                      11,2110   00003 1                    2D
 10282                      11,2111   77606 1            PUSH                                                   (PL20D)
 10283                      11,2112   71350 1            LXA,1   DLOAD
 10284  REF  3  LAST  454   11,2113   03745 1                    RTX1
 10285                      11,2114   00023 0                    18D
 10286                      11,2115   62040 1            BMN     INCR,1
```

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 10287                          11,2116   22120 1                 +2
 10288                          11,2117   77767 1          DEC    -8
 10289                          11,2120   67310 1          INCR,1 SLOAD
 1029                           11,2121   00012 1                 10D
 10291  REF  4  LAST  461       11,2122   00047 1                 X1
 10292                          11,2123   77230 0          BHIZ   VLOAD                          (PL14D)
 10293                          11,2124   22126 1                 +2
 10294                          11,2125   41476 1          VCOMP  PUSH                           (PL20D)
 10295                          11,2126   77775 1          VLOAD                                 (PL14D)
 10296                          11,2127   50235 0          VXV    DOT                            (PL 2D)
 1032                           11,2130   71244 0          BPL    DLOAD                          (PL 0D)
 1033   REF  1                  11,2131   22133 0                 INITVEL4
 1034                           11,2132   41476 1          DCOMP  PUSH                           (PL 2D)
 1035                           11,2133   67154 0  INITVEL4 LXA,2  SXA,2
 1036                           11,2134   00000 1                 0D
 1037   REF  2  LAST   93       11,2135   02674 0                 GEOMSGN
R1038     SET INPUTS UP FOR LAMBERT

 1039                           11,2136   45150 1          LXA,1  CALL
 1040   REF  4  LAST  478       11,2137   03745 1                 RTX1
R1041      OPERATE THE LAMBERT CONIC ROUTINE (COASTFLT SUBROUTINE)

 1042   REF  1                  11,2140   25215 0                 LAMBERT
R1043        DELETE THRU 4521
R1044   ARRIVED AT SOLUTION IS GOOD ENOUGH ACCORDING TO SLIGHTLY WIDER BOUNDS.

 1045                           11,2141   77214 0          CLEAR  VLOAD
 1046   REF  2  LAST  477       11,2142   00675 0                 GUESSW
 1047   REF  3  LAST  454       11,2143   02746 0                 VVEC
R1048   STORE CALCULATED INITIAL VELOCITY REQUIRED IN VIPRIME
R1049
 1050   REF  4  LAST  455       11,2144   17612 1          STODL  VIPRIME        INITIAL VELOCITY REQUIRED  (+7)
R1051
R1052      IF NUMIT IS ZERO, CONTINUE AT INITVELB, OTHERWISE
R1053   SET UP INPUTS FOR ENCKE INTEGRATION (INTEGRVS).

 1054   REF  3  LAST  477       11,2145   02704 0                 VTARGTAG
 1055                           11,2146   45030 0          BHIZ   CALL
 1056   REF  1                  11,2147   22224 0                 INITVEL7
 1057   REF  7  LAST  469       11,2150   27371 1                 INTSTALL
 1061                           11,2151   43135 1          SLOAD  CLEAR
 1062   REF  4  LAST  477       11,2152   03747 0                 RTX2
 1063   REF  3  LAST  469       11,2153   00263 0                 MOONFLAG
 1064                           11,2154   43030 0          BHIZ   SET
 1065   REF  1                  11,2155   22157 1                 INITVEL5
 1066   REF  4  LAST  479       11,2156   00063 1                 MOONFLAG
 1067                           11,2157   77775 1  INITVEL5 VLOAD
 1068   REF  8  LAST  478       11,2160   03570 0                 RINIT
 1069   REF  5  LAST  478       11,2161   02657 1          STORE  RIVEC
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 1070   REF   5  LAST  469   11,2162   25535 C          STOVL  RCV
 1071   REF   5  LAST  479   11,2163   03612 1                 VIPRIME
 1072   REF   5  LAST  469   11,2164   15543 1          STODL  VCV
 1073   REF   6  LAST  469   11,2165   03503 1                 INTIME
 1074   REF   5  LAST  469   11,2166   01517 C          STORE  TET
 1075                        11,2167   43015 1          DAD    CLEAR
 1076   REF   6  LAST  478   11,2170   03423 1                 DELLT4
 1077   REF   3  LAST  469   11,2171   01673 1                 INTYPFLG
 1078   REF   7  LAST  469   11,2172   34041 C          STCALL TDEC1
 1079   REF   2  LAST  469   11,2173   27066 1                 INTEGRVS
 1080                        11,2174   77775 1          VLOAD
 1081   REF   1              11,2175   00025 C                 VATT1
 1082   REF   2  LAST   93   11,2176   02705 1          STORE  VTARGET
R1083    IF ITERATION COUNTER (ITCTR) EQ NO. ITERATIONS (NUMIT), CONTINUE AT
R1084   INITVELC, OTHERWISE REITERATE LAMBERT AND ENCKE

 1085                        11,2177   63154 1          LXA,2  INCR,2
 1086   REF   3  LAST  478   11,2200   03504 C                 ITCTR
 1087                        11,2201   00001 C                 1D              INCREMENT ITCTR
 1088                        11,2202   55134 1          SXA,2  XSU,2
 1089   REF   4  LAST  480   11,2203   03504 C                 ITCTR
 1090   REF   4  LAST  479   11,2204   02703 1                 VTARGTAG
 1091                        11,2205   46135 1          SLOAD  BHIZ            IF SP(MPAC) EQ 0, CONTINUE AT INITVELC
 1092   REF   2  LAST  448   11,2206   00050 1                 X2
 1093   REF   1              11,2207   22221 C                 INITVEL6
R1094
R1095     OFFSET CONIC TARGET VECTOR

 1096                        11,2210   52375 1          VLOAD  VSU
 1097   REF   8  LAST  478   11,2211   03604 C                 RTARG1
 1098   REF   1              11,2212   00017 1                 RATT1
 1099                        11,2213   77655 1          VAD
 1100   REF   7  LAST  478   11,2214   02665 C                 R2VEC
 1101   REF   8  LAST  480   11,2215   16665 C          STODL  R2VEC
 1102   REF   5  LAST  478   11,2216   03630 1                 COZY4
 1103                        11,2217   77650 1          GOTO
 1104   REF   1              11,2220   22056 1                 INITVEL2        CONTINUE ITERATING AT INITVEL2
R1105   COMPUTE THE DELTA VELOCITY

 1106                        11,2221   77775 1  INITVEL6 VLOAD
 1107   REF   9  LAST  480   11,2222   02665 C                 R2VEC
 1108   REF   9  LAST  480   11,2223   03604 C          STORE  RTARG1
 1109                        11,2224   52375 1  INITVEL7 VLOAD  VSU
 1110   REF   6  LAST  480   11,2225   03612 1                 VIPRIME
 1111   REF   7  LAST  478   11,2226   03576 C                 VINIT
 1112   REF   9  LAST  470   11,2227   27646 C          STOVL  DELVEET3        DELVEET3 = VIPRIME-VINIT  (+7)
 1113   REF   3  LAST  480   11,2230   02705 1                 VTARGET
 1114   REF   4  LAST  455   11,2231   03620 C          STORE  VTPRIME
 1115                        11,2232   46135 1          SLOAD  BHIZ
 1116   REF   5  LAST  479   11,2233   03747 C                 RTX2
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 1117   REF   1                  11,2234   22251 1                 INITVELX
 11171                           11,2235   70575 1          VLOAD  VSR2
 11172  REF   5  LAST  480       11,2236   03620 0                 VTPRIME
 1118   REF   6  LAST  481       11,2237   27620 0          STOVL  VTPRIME
 1119   REF   7  LAST  480       11,2240   03612 1                 VIPRIME
 1120                            11,2241   77742 0          VSR2
 1121   REF   8  LAST  481       11,2242   27612 1          STOVL  VIPRIME
 1122   REF  10  LAST  480       11,2243   03604 0                 RTARG1
 1123                            11,2244   77742 0          VSR2
 1124   REF  11  LAST  481       11,2245   27604 0          STOVL  RTARG1
 1125   REF  10  LAST  480       11,2246   03646 0                 DELVEET3
 1126                            11,2247   77742 0          VSR2
 1127   REF  11  LAST  481       11,2250   03646 0          STORE  DELVEET3
 1128                            11,2251   77201 1 INITVELX SETPD  VLOAD
 1129                            11,2252   00001 0                 0D
 1130   REF  12  LAST  481       11,2253   03604 0                 RTARG1
 1131   REF   8  LAST  477       11,2254   37415 0          STCALL RTARG
 1134   REF  12  LAST  477       11,2255   01340 1                 NORMEX
R1135
R1136    ..... END OF INITVEL ROUTINE .....
```

P1137 ..... MIDGIM .....

R1138 MOD NO. 0, BY WILLMAN, SUBROUTINE RENDGUID, LOG P34-P35, P74-P75
R1139 REVISION 03, 17 FEB 67

R1140 IF THE ACTIVE VEHICLE IS DOING THE COMPUTATION, MIDGIM COMPUTES
R1141 THE POSITIVE MIDDLE GIMBAL ANGLE OF THE ACTIVE VEHICLE TO THE INPUT
R1142 DELTA VELOCITY VECTOR (DD IN PUSH LIST), OTHERWISE
R1143 MIDGIM CONVERTS THE INPUT DELTA VELOCITY VECTOR FROM INERTIAL COORDIN-
R1144 ATES TO LOCAL VERTICAL COORDINATES OF THE ACTIVE VEHICLE.

R1145 .. INPUTS ..

	NAME	MEANING	UNITS/SCALING/MODE
R1146			
R1147	AVFLAG	INT FLAG - 0 IS CSM ACTIVE, 1 IS LEM ACTIVE	BIT
R1148	COMPUTER	INT FLAG - 0 IS LEM COMPUTER, 1 IS CSM COMPUTER	BIT
R1149	RINIT	ACTIVE VEHICLE RADIUS VECTOR	METERS/CSEC (+7) VT
R1150	VINIT	ACTIVE VEHICLE VELOCITY VECTOR	METERS/CSEC (+7) VT
R1151	DD (PL)	ACTIVE VEHICLE DELTA VELOCITY VECTOR	METERS/CSEC (+7) VT

R1152 .. OUTPUTS ..

	NAME	MEANING	UNITS/SCALING/MODE
R1153			
R1154	+MGA	+ MIDDLE GIMBAL ANGLE	REVOLUTIONS (+0) DP
R1155	DELVLVC	DELTA VELOCITY VECTOR IN LV COORD.	METERS/CSEC (+7) VT
R1156	MGLVFLAG	INT FLAG - 0 IS +MGA COMPUTED, 1 IS DELVLVC COMP.	- BIT

R1157 .. CALLING SEQUENCE ..

```
R1158  L        CALL
R1159  L+1            MIDGIM
R1160  L+2      (RETURN - ALWAYS)
```

R1161 .. NO SUBROUTINES CALLED ..

R1162 .. DEBRIS - ERASEABLE TEMPORARY USAGE

R1163 A,Q,L, PUSH LIST, MPAC.

R1164 .. ALARMS - NONE ..

```
P1165   MIDDLE GIMBAL ANGLE COMPUTATION.

 1166   REF   1                 04,2000                         SETLOC MIDDGIM
 1167                           04,2651                         BANK

 1168   REF   1                                                 COUNT* $$/MIDG

 1169                           04,2651  20000 C  HALFREV  2DEC   1 B-1
 1169                           04,2652  00000 1
 1170                           04,2653  43014 C  MIDGIM   BON    BOFF
 1171   REF   1                 04,2654  01312 0                 AVFLAG
 1172   REF   1                 04,2655  10673 1                 MIDGIM1
 1173   REF   1                 04,2656  02747 1                 COMPUTER
 1174   REF   1                 04,2657  10676 1                 GET.LVC
R1175   COMPUTE +MGA IF AVFLAG AND COMPUTER HAVE OPPOSITE VALUES.
 1176                           04,2660  53575 C  GET+MGA  VLOAD  UNIT          (PL 0D) V (+7) TO MPAC, UNITIZE  UV (+1)
 1177                           04,2661  72441 C           DOT    SL1           DOT UV WITH Y(STABLE MEMBER) AND RESCALE
 1178   REF   3  LAST  168      04,2662  01744 1                 REFSMMAT +6     FROM +2 TO +1 FOR ASIN ROUTINE
 1179                           04,2663  51136 1           ARCSIN BPL
 1180   REF   1                 04,2664  10670 1                 SETMGA
 1181                           04,2665  43215 C           DAD    DAD           CONVERT -MGA TO +MGA BY
 1182   REF   1                 04,2666  10652 1                 HALFREV       ADDING ONE REVOLUTION
 1183   REF   2  LAST  483      04,2667  10652 1                 HALFREV
 1184   REF   6  LAST  471      04,2670  03626 C  SETMGA   STORE  +MGA
 1185                           04,2671  43414 1           CLR    RVQ           CLEAR MGLVFLAG TO INDICATE +MGA CALC
 1186   REF   1                 04,2672  02675 1                 MGLVFLAG        AND EXIT
 1187                           04,2673  77614 1  MIDGIM1  BOFF
 1188   REF   2  LAST  483      04,2674  02747 1                 COMPUTER
 1189   REF   2  LAST  471      04,2675  10660 C                 GET+MGA
R1190   COMPUTE DELVLVC IF AVFLAG AND COMPUTER HAVE SAME VALUES.
 1191                           04,2676  53575 C  GET.LVC  VLOAD  UNIT          (PL 6D)   R (+29) IN MPAC, UNITIZE  UR
 1192   REF   9  LAST  479      04,2677  03570 C                 RINIT
 1193                           04,2700  77676 C           VCOMP                 U(-R)
 1194                           04,2701  00023 C           STORE  18D           U(-R) TO 18D
 1195                           04,2702  53435 C           VXV    UNIT          U(-R)*V EQ V*U(R), U(V*R)
 1196   REF   8  LAST  48C      04,2703  03576 C                 VINIT
 1197                           04,2704  00015 C           STORE  12D           U(V*R) TO 12D
 1198                           04,2705  53435 C           VXV    UNIT          U(V*R)*U(-R), U((V*R)*(-R))
 1199                           04,2706  00023 C                  18D
 1200                           04,2707  24007 C           STOVL  6D            TRANSFORMATION MATRIX IS IN 6D (+1)
 1201                           04,2710  00001 C                  0D            DELTA V (+7) IN 0D
 1202                           04,2711  76521 C           MXV    VSL1          CONVERT FROM INER COOR TO LV COOR (+8)
 1203                           04,2712  00007 0                  6D             AND SCALE +7 IN MPAC
 1204   REF   9  LAST  467      04,2713  03405 C           STORE  DELVLVC       STORE IN DELVLVC (+7)
 1205                           04,2714  43414 1           SET    RVQ           SET MGLVFLAG TO INDICATE LVC CALC
 1206   REF   2  LAST  483      04,2715  02475 C                 MGLVFLAG        AND EXIT
R1207     ..... END OF MIDGIM ROUTINE .....
```

```
P1208
 1209                          04,2716   77160 0  SELECTMU AXC,1  AXT,2
 1210                          04,2717   00002 0                  2D
 1211                          04,2720   00000 1                  0D
 1212                          04,2721   77614 1           BOFF
 1213  REF   3  LAST  469      04,2722   04343 1                  CMOONFLG
 1214  REF   1                 04,2723   10727 1                  SETMUER
 1215                          04,2724   77160 0           AXC,1  AXT,2
 1216                          04,2725   00012 1                  10D
 1217                          04,2726   00002 0                  2D
 1218                          04,2727   66143 1  SETMUER  DLOAD*  SXA,1
 1219  REF   1                 04,2730   11632 0                  MUTABLE +4,1
 1220  REF   5  LAST  479      04,2731   03745 1                  RTX1
 1221  REF   2  LAST  123      04,2732   23752 0           STODL*  RTSR1/MU
 1222  REF   2  LAST  484      04,2733   11624 1                  MUTABLE -2,1
 1223                          04,2734   54214 1           BOFF    SR
 1224  REF   4  LAST  484      04,2735   04343 1                  CMOONFLG
 1225  REF   1                 04,2736   10740 0                  RTRNMU
 1226                          04,2737   20607 1                  6D
 1227  REF   2  LAST  123      04,2740   03750 0  RTRNMU  STORE   RTMU
 1228                          04,2741   43134 0           SXA,2   CLEAR
 1229  REF   6  LAST  480      04,2742   03746 1                  RTX2
 1230  REF   4  LAST  472      04,2743   01271 1                  FINALFLG
 1234                          04,2744   77650 1           GOTO
 1235  REF   3  LAST  458      04,2745   73005 0                  VN1645
```

```
P1236   ..... PERIAPO .....

R1237   MCC NC -1        LCC SECTION - P34-P35, P74-P75
R1238   MCC BY WHITE.P   DATE  18JAN68

R1239   FUNCTIONAL DESCRIPTION

R1240           THIS SUBROUTINE COMPUTES THE TWO BODY APOCENTER AND PERICENTER
R1241           ALTITUDES GIVEN THE POSITION AND VELOCITY VECTORS FOR A POINT ON
R1242           THE TRAJECTORY AND THE PRIMARY BODY.

R1243           SETRAD IS CALLED TO  DETERMINE THE RADIUS OF THE PRIMARY BODY.

R1244           APSIDES IS CALLED TO SOLVE FOR THE TWO BODY RADII OF APOCENTER AND
R1245           PERICENTER AND THE ECCENTRICITY OF THE TRAJECTORY.

R1246   CALLING SEQUENCE

R1247           L           CALL
R1248           L+1                 PERIAPO
R1249           L+2         (RETURN - ALWAYS)

R1250   INPUT

R1251           (1) RVEC    POSITION VECTOR IN METERS
R1252                       SCALE FACTOR - EARTH +29, MOON +27
R1253           (2) VVEC    VELOCITY VECTOR IN METERS/CENTISECOND
R1254                       SCALE FACTOR - EARTH +7, MOON +5
R1255           (3) X1      PRIMARY BODY INDICATOR
R1256                       EARTH -2, MOON -10

R1257   OUTPUT

R1258           (1) 2D      APOCENTER RADIUS IN METERS
R1259                       SCALE FACTOR - EARTH +29, MOON +27
R1260           (2) 4D      APOCENTER ALTITUDE IN METERS
R1261                       SCALE FACTOR - EARTH +29, MOON P27
R1262           (3) 6D      PERICENTER RADIUS IN METERS
R1263                       SCALE FACTOR - EARTH +29, MOON +27
R1264           (4) 8D      PERICENTER ALTITUDE IN METERS
R1265                       SCALE FACTOR - EARTH +29, MOON +27
R1266           (5) ECC     ECCENTRICITY OF CONIC TRAJECTORY
R1267                       SCALE FACTOR - +3
R1268           (6) XXXALT  RADIUS OF THE PRIMARY BODY IN METERS
R1269                       SCALE FACTOR - EARTH +29, MOON +27
R1270           (7) PUSHLOC EQUALS 10D

R1271   SUBROUTINES USED

R1272           SETRAD
```

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R1273 APSIDES

```
 1274  REF  1                22,2000                        SETLOC APOPERI
 1275                        22,3310                        BANK

 1276  REF  1                                               COUNT* $$/PERAP

 1277                        22,3310   00302 C  RPAD        2DEC   6373338 B-29    STANDARD RADIUS  OF PAD 37-8.
 1277                        22,3311   17755 C
A1278                                                                              = 20 909 901.57 FT

 1279                        22,3312   53754 1  PERIAPO1    LXA,2  VSR*
 1280  REF  7  LAST  484     22,3313   03746 1               RTX2
 1281                        22,3314   57176 C               0,2
 1282  REF  4  LAST  479     22,3315   26746 C               STOVL  VVEC
 1283                        22,3316   53750 C               LXA,1  VSR*
 1284  REF  6  LAST  484     22,3317   03745 1               RTX1
 1285                        22,3320   57176 C               0,2
 1286  REF  2  LAST  454     22,3321   02657 1               STORE  RVEC
 1287                        22,3322   45020 1  PERIAPO     STQ    CALL
 1288  REF  13 LAST  481     22,3323   01340 1               NORMEX
 1289  REF  1                22,3324   45340 1               SETRAD
 1290  REF  2  LAST  119     22,3325   37456 1               STCALL XXXALT
 1291  REF  1                22,3326   25671 C               APSIDES
 1292                        22,3327   41401 1  SETPD       PUSH   2D = APOCENTER RADIUS   B29 OR B27
 1293                        22,3330   00003 1               2D
 1294                        22,3331   65225 1  DSU         PDDL   4D = APOGEE ALTITUDE    B29 OR B27
 1295  REF  3  LAST  486     22,3332   03456 C               XXXALT
 1296                        22,3333   00001 C               0D
 1297                        22,3334   45206 1  PUSH        DSU    6D = PERICENTER RADIUS  B29 OR B27
 1298  REF  4  LAST  486     22,3335   03456 C               XXXALT
 1299                        22,3336   52006 C  PUSH        GOTO   8D = PERIGEE ALTITUDE   B29 OR B27
 1300  REF  14 LAST  486     22,3337   01340 1               NORMEX
```

```
P1301   SETRAC
 1302                          22,3340   41545 C  SETRAC   DLOAD   PUSH
 1303   REF   1                22,3341   05311 1                  RPAD
 1304                          22,3342   63130 C           SXA,1   INCR,2
 1305   REF   3  LAST  480     22,3343   00047 1                   X2
 1306                          22,3344   00002 C                   2D
 1307                          22,3345   46135 1           SLOAD   BHIZ
 1308   REF   4  LAST  487     22,3346   00050 1                   X2
 1309   REF   1                22,3347   45353 C                   SETRADX
 1310                          22,3350   51575 1           VLOAD   ABVAL
 1311   REF   2  LAST  174     22,3351   02026 1                   RLS
 1312                          22,3352   77725 1           PDDL
 1313                          22,3353   43545 1  SETRADX  DLOAD   RVQ
```

```
P1314   PRECSET
 1315                            22,3354   77620 C  PRECSET  STQ
 1316   REF  15  LAST  486       22,3355   01340 1                    NORMEX
 1317   REF   1                  22,3356   36635 1           STCALL   TDEC2
 1318   REF   2  LAST   32       22,3357   27036 1                    LEMPREC
 1319                            22,3360   77624 1           CALL
 1320   REF   1                  22,3361   45372 C                    LEMSTORE
 1321                            22,3362   77745 1           DLOAD
 1322   REF   2  LAST  488       22,3363   02635 0                    TDEC2
 1323   REF   8  LAST  480       22,3364   34041 C           STCALL   TDEC1
 1324   REF   2  LAST   32       22,3365   27022 1                    CSMPREC
 1325                            22,3366   77624 1           CALL
 1326   REF   1                  22,3367   45402 C                    CSMSTORE
 1327                            22,3370   77650 1           GOTO
 1328   REF  16  LAST  488       22,3371   01340 1                    NORMEX
 1329                            22,3372   43175 C  LEMSTORE VLOAD    BOFF
 1330   REF   5  LAST  469       22,3373   00001 C                    RATT
 1331   REF   2  LAST  483       22,3374   01352 1                    AVFLAG
 1332   REF   2  LAST  462       22,3375   45406 1                    PASSIVE
 1333   REF  15  LAST  469       22,3376   27540 C  ACTIVE    STOVL    RACT3
 1334   REF   2  LAST  465       22,3377   00007 C                    VATT
 1335   REF   7  LAST  467       22,3400   03546 C           STORE    VACT3
 1336                            22,3401   77616 C           RVQ
 1337                            22,3402   43175 C  CSMSTORE VLOAD    BOFF
 1338   REF   6  LAST  488       22,3403   00001 0                    RATT
 1339   REF   3  LAST  488       22,3404   01352 1                    AVFLAG
 1340   REF   2  LAST  462       22,3405   45376 1                    ACTIVE
 1341   REF   7  LAST  465       22,3406   27554 C  PASSIVE  STOVL    RPASS3
 1342   REF   3  LAST  488       22,3407   00007 C                    VATT
 1343   REF   7  LAST  465       22,3410   03562 C           STORE    VPASS3
 1344                            22,3411   77616 C           RVQ
```

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```
P1345   VECSHIFT
 1346                          22,3412   53754 1  VECSHIFT LXA,2  VSR*
 1347   REF   8  LAST  486     22,3413   03746 1                  RTX2
 1348                          22,3414   57176 C                  0,2
 1349                          22,3415   63350 1           LXA,1  PDVL
 1350   REF   7  LAST  486     22,3416   03745 1                  RTX1
 1351                          22,3417   63257 1           VSR*   PDVL
 1352                          22,3420   57176 C                  0,2
 1353                          22,3421   77616 C           RVQ
```

```
P1354   SHIFTR1
 1355                        22,3422   53754 1  SHIFTR1  LXA,2  SL*
 1356   REF   S  LAST  489   22,3423   03746 1                  RTX2
 1357                        22,3424   57576 1                  0,2
 1358                        22,3425   77616 0           RVQ
```

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R1359 PROGRAM DESCRIPTION
R1360 SUBROUTINE NAME R36 OUT-OF-PLANE RENDEZVOUS ROUTINE
R1361 MOD NO. 0 DATE 22 DECEMBER 67
R1362 MOD BY N.M.NEVILLE LOG SECTION EXTENDED VERBS
R1363 FUNCTIONAL DESCRIPTION

R1364 TO DISPLAY AT ASTRONAUT REQUEST LGC CALCULATED RENDEZVOUS
R1365 OUT-OF-PLANE PARAMETERS (Y , YDOT , PSI). (REQUESTED BY DSKY).

R1366 CALLING SEQUENCE

R1367 ASTRONAUT REQUEST THROUGH DSKY V 90 E

R1368 SUBROUTINES CALLED

R1369 EXCSPRET
R1370 GOMARKF
R1371 CSMPREC
R1372 LEMPREC
R1373 SGNAGREE
R1374 LOADTIME

R1375 NORMAL EXIT MODES

R1376 ASTRONAUT REQUEST THROUGH DSKY TO TERMINATE PROGRAM V 34 E

R1377 ALARM OR ABORT EXIT MODES

R1378 NONE

R1379 OUTPUT

R1380 DECIMAL DISPLAY OF TIME , Y , YDOT AND PSI

R1381 DISPLAYED VALUES Y , YDOT , AND PSI , ARE STORED IN ERASABLE
R1382 REGISTERS RANGE , RRATE AND RTHETA RESPECTIVELY.

R1383 ERASABLE INITIALIZATION REQUIRED

R1384 CSM AND LEM STATE VECTORS

R1385 DEBRIS

R1386 CENTRALS A,Q,L

R1387 OTHER THOSE USED BY THE ABOVE LISTED SUBROUTINES

```
 1388                        20,2000          BANK   20
 1389  REF   1               04,2000          SETLOC R36LM
 1390                        04,2746          BANK
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1391  REF   3  LAST  259   E4,1726                          EBANK= RPASS36

1392  REF   1                                               COUNT* $$/R36

1393                        04,2746  22 007 C  R36          ZL
1394  REF 104  LAST  445    04,2747  3 4714 1               CAF     ZERO      SET TIME OF EVENT TO ZERO FOR FIRST
1395  REF   3  LAST  264    04,2750  53*052 C               DXCH    DSPTEMX   DISPLAY
1396  REF   1              04,2751  3 3101 1               CAF     V06N16N
1397  REF  93  LAST  474    04,2752  0 4555 C               TC      BANKCALL
1398  REF   2  LAST  239    04,2753   20465 1               CADR    GOMARKF
1399  REF  19  LAST  418    04,2754  1 5423 C               TCF     ENDEXT    TERMINATE
1400                        04,2755  1 2757 1               TCF     +2        PROCEED
1401                        04,2756  1 2751 1               TCF     -5        RECYCLE FOR ASTRONAUT INPUT TIME
1402  REF   4  LAST  492    04,2757  53*052 C               DXCH    DSPTEMX
1403                        04,2760  0 0006 1               EXTEND
1404  REF   1              04,2761  1 3070 1               BZF     LREGCHK   A-REG ZERO GOTO CHECK L-REG FOR ZERO
1405  REF 237  LAST  477    04,2762  52 155 1  ASTROTIM     DXCH    MPAC      A-REG NON-ZERO, TIME = ASTRO INPUT TIME
1406  REF  49  LAST  472    04,2763  0 6006 1               TC      INTPRET
1407                        04,2764   77634 C               RTB
1408  REF   1              04,2765   45713 C                       DPMODE
1409  REF   9  LAST  488    04,2766   34041 C  R36INT       STCALL  TDEC1
1410  REF   2  LAST  448    04,2767   27036 1                       OTHPREC
1411                        04,2770   63375 C               VLOAD   PDVL
1412  REF   4  LAST  488    04,2771   00007 C                       VATT
1413  REF   7  LAST  488    04,2772   00001 C                       RATT      -
1414  REF   4  LAST  492    04,2773   02327 C               STORE   RPASS36   R
1415                        04,2774   63256 C               UNIT    PDVL        P
1416                        04,2775   53435 C               VXV     UNIT      -
1417                        04,2776   77626 C               STADR
1418  REF   1              04,2777   61442 1               STODL   UNP36     U
1419  REF   2  LAST  449    04,3000   00015 C                       TAT
1420  REF  10  LAST  492    04,3001   34041 C               STCALL  TDEC1
1421  REF   2  LAST  448    04,3002   27022 1                       THISPREC
1422                        04,3003   63375 C               VLOAD   PDVL                    -
1423  REF   5  LAST  492    04,3004   00007 C                       VATT      VELOCITY VECTOR  V              00D
1424  REF   8  LAST  492    04,3005   00001 C                       RATT                       A
1425                        04,3006   77725 1               PDDL
1426  REF   3  LAST  492    04,3007   00015 C                       TAT       SAVE TIME IN LOCATION 30D FOR REDISPLAY
1427                        04,3010   24037 C               STOVL   30D                     -
1428                        04,3011   41406 C               PUSH    PUSH      POSITION VECTOR  R   IN  06D AND 12D
1429                        04,3012   63245 1               BVSU    PDVL                       A  -   -
1430  REF   5  LAST  492    04,3013   02327 C                       RPASS36   LINE OF SIGHT VECTOR R - R       12D
1431                        04,3014   72441 C               DOT     SL1                           P   A
1432  REF   2  LAST  492    04,3015   02335 C                       UNP36       -  -
1433  REF   9  LAST  275    04,3016   26321 C               STOVL   RANGE     Y = U .R
1434                        04,3017   00001 C                       00D     -       A
1435                        04,3020   72441 C               DOT     SL1
1436  REF   3  LAST  492    04,3021   02335 C                       UNP36     .   -  -
1437  REF   5  LAST  275    04,3022   26323 1               STOVL   RRATE     Y = U .V
1438                        04,3023   00007 C                       06D     -       A   -
```

```
1439                          04,3024  41456 C   UNIT    PUSH    U    = UNIT( R )                    18D
1440                          04,3025  47235 C   VXV     VXV      RA          A
1441                          04,3026  00001 C             00D     -    -    -     -
1442                          04,3027  00023 C             18D    (U   XV )XU    =U
1443                          04,3030  53552 C   VSL2    UNIT      RA  A   RA    A
144305                        04,3031  77656 1   UNIT
1444                          04,3032  24001 C   STOVL   00D     UNIT HORIZONTAL IN FORWARD DIR.  00D
1445                          04,3033  00023 C             18D
1446                          04,3034  74241 C   DOT     VXSC    -
1447                          04,3035  00015 C             12D     U
1448                          04,3036  77752 1   VSL2             L
1449                          04,3037  53445 1   BVSU    UNIT
144905                        04,3040  77656 1   UNIT
1450                          04,3041  50206 C   PUSH    DOT     LOS PROJECTED INTO HORIZONTAL    12D
1451                          04,3042  00001 C             00D     PLANE
1452                          04,3043  65552 C   SL1     ARCCOS                  -  -
1453  REF   6  LAST  275      04,3044  26325 1   STOVL   RTHETA  PSI= ARCCOS(U .U )
1454                          04,3045  50235 C   VXV     DOT                   A  L
1455                          04,3046  00001 C             00D
1456                          04,3047  71244 C   BPL     DLOAD
1457  REF   1                 04,3050  11055 1             R36TAG2
1458  REF   1                 04,3051  11464 1             LODPMAX
1459                          04,3052  77625 C   DSU
1460  REF   7  LAST  493      04,3053  02325 1             RTHETA
1461  REF   8  LAST  493      04,3054  02325 1   STORE   RTHETA
1462                          04,3055  47145 1   R36TAG2 DLOAD   RTB
1463                          04,3056  00037 C             30D
1464  REF   2  LAST  417      04,3057  45541 C             SGNAGREE
1465  REF   5  LAST  492      04,3060  01052 1   STORE   DSPTEMX
1466                          04,3061  77776 1   EXIT
1467  REF   1                 04,3062  3 3102 1  CAF     V06N90N         DISPLAY Y , YDOT , AND PST
1468  REF  94  LAST  492      04,3063  0 4555 C  TC      BANKCALL
1469  REF   3  LAST  492      04,3064   20465 1  CADR    GOMARKF
1470  REF  20  LAST  492      04,3065  1 5423 C  TCF     ENDEXT          TERMINATE
1471  REF  21  LAST  493      04,3066  1 5423 C  TCF     ENDEXT          PROCEED , END OF PROGRAM
1472  REF   2  LAST  259      04,3067  1 2751 1  TCF     R36 +3          REDISPLAY OUTPUT
1473  REF  56  LAST  44C      04,3070  56 001 C  LREGCHK  XCH     L
1474                          04,3071  0 0006 1  EXTEND
1475  REF   1                 04,3072  1 3075 1  BZF     ENTTIM2         L-REG ZERO ,SET TIME = PRESENT TIME
1476  REF  57  LAST  493      04,3073  56 001 0  XCH     L               L-REG NON ZERO, TIME = ASTRO INPUT TIME
1477  REF   1                 04,3074  1 2762 1  TCF     ASTRCTIM
1478  REF  5C  LAST  492      04,3075  0 6006 1  ENTTIM2 TC      INTPRET
1479                          04,3076   52034 1  RTB     GOTO
1480  REF   4  LAST  45E      04,3077   45505 C           LOADTIME
1481  REF   1                 04,3100   10766 1           R36INT
1482                          04,3101  01420 C   V06N16N  VN      00616
1483                          04,3102  01532 1   V06N90N  VN      0069C
```

```
P3000
 3001                          34,2002                          BANK   34
 3002   REF   1                35,2000                          SETLOC R31
 3003                          35,3150                          BANK

 3004   REF   1                                                 COUNT* $$/R31

 30041  REF   1                35,3150  3 4752 C  R31CALL       CAF    PRIO3
 30042  REF  17  LAST  428     35,3151  0 5042 1                TC     FINDVAC
 30043  REF  12  LAST  471     E4,1770                          EBANK= SUBEXIT
 30044  REF   2  LAST   32     35,3152   03204 1                2CADR  V83CALL
 30044                         35,3153   72064 C
 30045  REF   3  LAST  471     35,3154  3 4734 C  DSPDELAY      CAF    1SEC
 30046  REF  55  LAST  493     35,3155  0 4555 C                TC     BANKCALL
 30047  REF   3  LAST  471     35,3156   01730 1                CADR   DELAYJOB
 30048  REF   9  LAST  230     35,3157  3 1044 C                CA     EXTVBACT
 300485 REF  21  LAST  383     35,3160  7 4677 1                MASK   BIT12
 30049                         35,3161  0 0006 1                EXTEND
 300495 REF   1                35,3162  1 3154 C                BZF    DSPDELAY

 3005   REF   7  LAST  259     35,3163  3 0105 C  DISPN5X       CA     FLAGWRD9        TEST R31FLAG (IN SUNDANCE R31FLAG WILL
 30051  REF  23  LAST  378     35,3164  7 4707 1                MASK   BIT4               ALWAYS BE SET AS R34 DOES NOT EXIST)
 300515                        35,3165  0 0006 1                EXTEND
 30052                         35,3166  1 3171 1                BZF    +3
 30053  REF   1                35,3167  3 3310 C                CAF    V16N54          R31    USE NOUN 54
 30054                         35,3170  0 3172 C                TC     +2
 30055  REF   1                35,3171  3 3311 1                CAF    V16N53          R34    USE NOUN 53
 3006   REF  56  LAST  494     35,3172  0 4555 C                TC     BANKCALL
 3007   REF   4  LAST  493     35,3173   20465 1                CADR   GOMARKF
 3008   REF   1                35,3174  0 5514 1                TC     B5OFF
 3009   REF   2  LAST  494     35,3175  0 5514 1                TC     B5OFF
 3010   REF   1                35,3176  1 3163 1                TCF    DISPN5X

 3014   REF  51  LAST  493     35,3177  0 6006 1  V83           TC     INTPRET
 3015                          35,3200   77624 1                CALL
 3016   REF   1                35,3201   73426 C                       REDOEXTP
 3017                          35,3202   77650 1                GOTO
 3018   REF   1                35,3203   73207 C                       COMPDISP
 3019   REF  52  LAST  494     35,3204  0 6006 1  V83CALL       TC     INTPRET
 3020                          35,3205   77624 1                CALL
 3021   REF   1                35,3206   73312 C                       STATEXTP        EXTRAPOLATE STATE VECTORS
 3022                          35,3207   52375 1  COMPDISP      VLOAD  VSU
 3023   REF   9  LAST  492     35,3210   00001 C                       RATT
 3024   REF   3  LAST   88     35,3211   02327 C                       RONE
 3025                          35,3212   51406 1                PUSH   ABVAL           RATT-RONE TO OD                 PD= 6
 3029   REF  10  LAST  492     35,3213   02321 C                STORE  RANGE           METERS B-29
 3030                          35,3214   77301 C                NORM   VLOAD
 3031   REF   5  LAST  479     35,3215   00047 1                       X1              RATT-RONE                       PD= 0
 30315                         35,3216   77762 1                VSR1
 3032                          35,3217   53457 1                VSL*   UNIT
```

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3033                          35,3220  20201 0                 0,1
3034                          35,3221  52315 1          PDVL   VSU     UNIT(LOS) TO OD                PD= 6
3035  REF  6  LAST  492       35,3222  00007 0                 VATT
3036  REF  2  LAST   88       35,3223  02335 0                 VONE
3037                          35,3224  77641 1          DOT                    (VATT-VONE).UNIT(LOS)          PD= 0
3039                          35,3225  77752 1          SL1
3040  REF  6  LAST  492       35,3226  36323 0          STCALL RRATE           RANGE RATE M/CS B-7
3041  REF  1                  35,3227  47432 1                 CDUTRIG        TO INITIALIZE FOR *NBSM*
30411                         35,3230  77624 1          CALL
30412 REF  1                  35,3231  62000 0                 R34LCS         NOTE. PDL MUST = 0.
3042                          35,3232  53575 0  R34ANG  VLOAD  UNIT
3043  REF  4  LAST  494       35,3233  02327 0                 RONE
3044                          35,3234  77715 1          PDVL                   UR TO OD                              PD= 6
3045  REF  1                  35,3235  15330 0                 THISAXIS       UNITX FOR CM, UNITZ FOR LM
30452                         35,3236  77214 0          BON    VLOAD          CHK R31FLAG. ON=R31 THETA, OFF=R34 PHI
30454 REF  1                  35,3237  04713 0                 R31FLAG
30455                         35,3240  73242 1                 +2                  R31-THETA
30456                         35,3241  00015 0                 12D
3045E                         35,3242  77624 1          CALL
3046  REF  1                  35,3243  47601 0                 *NBSM*
3047                          35,3244  41505 1          VXM    PUSH           UXORZ TO 6D                           PD=12D
3048  REF  4  LAST  483       35,3245  01736 1                 REFSMMAT
3049                          35,3246  72431 1          VPROJ  VSL2
3050                          35,3247  00001 0                 0D
3051                          35,3250  53445 1          BVSU   UNIT
3052                          35,3251  00007 0                 6D
3053                          35,3252  47315 0          PDVL   VXV     UP/2 TO 12D                           PD=18D
3054  REF  5  LAST  495       35,3253  02327 0                 RONE
3055  REF  3  LAST  495       35,3254  02335 0                 VONE
3056                          35,3255  47256 0          UNIT   VXV
3057  REF  6  LAST  495       35,3256  02327 0                 RONE
3058                          35,3257  63241 0          DOT    PDVL    SIGN TO 12D, UP/2 TO MPAC             PD=18D
3059                          35,3260  00015 0                 12D
3060                          35,3261  50372 1          VSL1   DOT     UP.UXORZ
3061                          35,3262  00007 0                 6D
3062                          35,3263  72565 1          SIGN   SL1
3063                          35,3264  00015 0                 12D
3064                          35,3265  77726 1          ACOS
3065  REF  9  LAST  493       35,3266  26325 1          STOVL  RTHETA
3066  REF  7  LAST  495       35,3267  02327 0                 RONE
3067                          35,3270  51041 0          DOT    BPL
3068                          35,3271  00007 0                 6D
3069                          35,3272  73277 1                 +5
3070                          35,3273  44345 0          DLOAD  BDSU    IF UXORZ.R NEG, RTHETA = 1 - RTHETA
3071  REF 10  LAST  495       35,3274  02325 1                 RTHETA
3072  REF  5  LAST  467       35,3275  15340 1                 DPPOSMAX
3073  REF 11  LAST  495       35,3276  02325 1          STORE  RTHETA         RTHETA BETWEEN 0 AND 1 REV.
3074                          35,3277  77776 1          EXIT
3075  REF 26  LAST  437       35,3300  3 4706 1         CAF    BIT5           HAVE WE BEEN ANSWERED
30751 REF 10  LAST  494       35,3301  7 1044 1         MASK   EXTVBACT
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3076                                35,3302  0 0006 1            EXTEND
3077   REF  22  LAST  493           35,3303  1 5423 0            BZF     ENDEXT          YES, DIE

3078   REF  11  LAST  495           35,3304  4 1044 1            CS      EXTVBACT
3079   REF  22  LAST  494           35,3305  7 4677 1            MASK    BIT12
3080   REF  12  LAST  496           35,3306  27'044 1            ADS     EXTVBACT

30805  REF   1                      35,3307  1 3177 1            TCF     V83
3081                                35,3310   04066 0  V16N54    VN      1654
3082                                35,3311   04065 0  V16N53    VN      1653
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R3083   THE STATEXTP SUBROUTINE DOES A PRECISION EXTRAPOLATION OF BOTH VEHICLES
R3084   STATE VECTORS TO PRESENT TIME AND SAVES THEM AS BASE VECTORS.
R3085   IF SERVICER IS OFF ---
R3086                   THIS VEHICLES BASE VECTOR IS CONIC EXTRAPOLATED TO
R3087                   PRESENT TIME AND SAVED AS RONE, VONE.
R3088                   THE OTHER VEHICLES BASE VECTOR IS CONIC EXTRAPOLATED
R3089                   TO THE SAME TIME, THE OUTPUT BEING LEFT IN RATT, VATT.
R3090   IF SERVICER IS ON  ---
R3091                   RONE, VONE ARE SET EQUAL TO RN, VN AND THE OTHER
R3092                   VEHICLES STATE VECTOR IS PREC. EXTRAPOLATED TO PIPTIME.
 3093                        35,3312   47020 C  STATEXTP STQ    RTB
 3094   REF   1              35,3313   02274 1                  STATEXIT
 3095   REF   5  LAST  493   35,3314   45505 C                  LOADTIME
 3096   REF  11  LAST  492   35,3315   34041 C            STCALL TDEC1
 3097   REF   3  LAST  492   35,3316   27036 1                  OTHPREC        GET BASE VECTORS
 3098                        35,3317   77775 1            VLOAD
 3099   REF   2  LAST  480   35,3320   00017 1                  RATT1
 3100   REF   1              35,3321   26225 C            STOVL BASEOTP        OTHER POS.
 3101   REF   2  LAST  480   35,3322   00025 C                  VATT1
 3102   REF   1              35,3323   16241 1            STODL BASEOTV        OTHER VEL.
 3103   REF   4  LAST  492   35,3324   00015 C                  TAT
 3104   REF   1              35,3325   02272 1            STORE BASETIME
 3105   REF  12  LAST  497   35,3326   34041 C            STCALL TDEC1
 3106   REF   3  LAST  492   35,3327   27022 1                  THISPREC
 3107                        35,3330   77775 1            VLOAD
 3108   REF   3  LAST  497   35,3331   00017 1                  RATT1
 3109   REF   1              35,3332   26255 1            STOVL BASETHP        THIS POS.
 3110   REF   3  LAST  497   35,3333   00025 C                  VATT1
 3111   REF   1              35,3334   02263 1            STORE BASETHV        THIS VEL
 3112                        35,3335   47014 1  HAVEBASE BON    RTB
 3113   REF   1              35,3336   03711 C                  V37FLAG
 3114   REF   1              35,3337   73413 C                  GETRVN         IF AVG ON ,GET RN ETC.
 3115   REF   6  LAST  497   35,3340   45505 C                  LOADTIME
 3116   REF  13  LAST  497   35,3341   34041 C            STCALL TDEC1         BEGIN SET UP FOR CONIC EXTRAP. FOR THIS.
 3117   REF   8  LAST  479   35,3342   27371 1                  INTSTALL
 3118                        35,3343   43175 C            VLOAD  CLEAR
 3119   REF   2  LAST  497   35,3344   02255 1                   BASETHP
 3120   REF   5  LAST  479   35,3345   00263 C                   MOONFLAG
 3121   REF   6  LAST  480   35,3346   25535 C            STOVL  RCV
 3122   REF   2  LAST  497   35,3347   02263 1                   BASETHV
 3123   REF   6  LAST  480   35,3350   15543 1            STODL  VCV
 3124   REF   2  LAST  497   35,3351   02272 1                   BASETIME
 3125                        35,3352   43014 C            BOF    SET           GET APPROPRIATE MOONFLAG SETTING
 3126   REF   4  LAST  259   35,3353   04343 1                   MOONTHIS
 3127                        35,3354   73356 C                   +2
 3128   REF   6  LAST  497   35,3355   00063 1                   MOONFLAG
 3129                        35,3356   77614 1            SET
 3130   REF   4  LAST  480   35,3357   01473 C                   INTYPFLG       CONIC EXTRAP.
 3131   REF   6  LAST  480   35,3360   35517 1            STCALL TET
 3132   REF   3  LAST  480   35,3361   27066 1                   INTEGRVS       INTEGRATION --- AT LAST---
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3133                                35,3362  77775 1          VLOAD
3134  REF  10  LAST  494            35,3363  00001 0                   RATT
3135  REF   8  LAST  495            35,3364  26327 0          STOVL    RONE
3136  REF   7  LAST  495            35,3365  00007 0                   VATT
3137  REF   4  LAST  495            35,3366  36335 1          STCALL   VONE          GET SET FOR CONIC EXTRAP.,OTHER.
3138  REF   9  LAST  497            35,3367  27371 1                   INTSTALL
3139                                35,3370  71214 0          SET      DLOAD
3140  REF   5  LAST  497            35,3371  01473 0                   INTYPFLG
3141  REF   5  LAST  497            35,3372  00015 0                   TAT
3142  REF  14  LAST  497            35,3373  00041 1  OTHINT   STORE    TDEC1
3143                                35,3374  43175 0          VLOAD    CLEAR
3144  REF   2  LAST  497            35,3375  02225 0                   BASECTP
3145  REF   7  LAST  497            35,3376  00263 0                   MOONFLAG
3146  REF   7  LAST  497            35,3377  25535 0          STOVL    RCV
3147  REF   2  LAST  497            35,3400  02241 1                   BASECTV
3148  REF   7  LAST  497            35,3401  15543 1          STODL    VCV
3149  REF   3  LAST  497            35,3402  02272 1                   BASETIME
3150                                35,3403  43014 0          BOF      SET
3151  REF   5  LAST  497            35,3404  04343 1                   MOONTHIS
3152                                35,3405  73407 0                   +2
3153  REF   8  LAST  498            35,3406  00063 1                   MOONFLAG
3154  REF   7  LAST  497            35,3407  35517 1          STCALL   TET
3155  REF   4  LAST  497            35,3410  27066 1                   INTEGRVS
3156                                35,3411  77650 1          GOTO
3157  REF   2  LAST  497            35,3412  02274 1                   STATEXIT       THIS VEHICLES POS.,VEL. IN PUSHLIST.

3158                                35,3413  77775 1  GETRVN   VLOAD
3159  REF   5  LAST  282            35,3414  01171 1                   RN
3160  REF   9  LAST  498            35,3415  26327 0          STOVL    RONE
3161  REF   5  LAST  282            35,3416  01177 1                   VN
3162  REF   5  LAST  498            35,3417  16335 0          STODL    VONE
3163  REF   4  LAST  282            35,3420  01205 1                   PIPTIME
3164                                35,3421  77624 1          CALL
3165  REF  10  LAST  498            35,3422  27371 1                   INTSTALL
3166                                35,3423  52014 0          CLEAR    GOTO
3167  REF   6  LAST  498            35,3424  01673 1                   INTYPFLG       PREC EXTRAP FOR OTHER
3168  REF   1                       35,3425  73373 1                   OTHINT

3169                                35,3426  52020 1  REDOEXTP STQ      GOTO
3170  REF   3  LAST  498            35,3427  02274 1                   STATEXIT
3171  REF   1                       35,3430  73335 0                   HAVEBASE
3172  REF   1                       31,2000                  SETLOC   R34
3173                                31,2000                  BANK
3174                                31,2000  77776 1  R34LOS   EXIT
3175  REF   8  LAST  275            31,2001  3 0036 1         CA       CDUS
3176  REF   2  LAST  258            31,2002  50 120 1         INDEX    FIXLOC
3177                                31,2003  54 011 0         TS       9D
3178  REF   7  LAST  275            31,2004  3 0035 1         CA       CDUT
3179  REF   3  LAST  498            31,2005  50 120 1         INDEX    FIXLOC
3180                                31,2006  54 013 1         TS       11D
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3181   REF   4  LAST  498   31,2007  3 0120 1        CA      FIXLOC
3182   REF  17  LAST  442   31,2010  6 6211 0        AD      SIX
3183                        31,2011  4 0000 0        COM
3184   REF   5  LAST  499   31,2012  50 120 1        INDEX   FIXLOC
3185   REF   6  LAST  494   31,2013  54 046 1        TS      X1
3186   REF  53  LAST  494   31,2014  0 6006 1        TC      INTPRET
3187                        31,2015   77624 1        CALL
3188   REF   2  LAST  445   31,2016   46000 0               SXTNB
3189                        31,2017   34015 1        STCALL  12D
3190   REF   1              31,2020   73232 0               R34ANG
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P5000   1) PROGRAM NAME - TARGET DELTA V PROGRAM (P76).
R5001   2) FUNCTIONAL DESCRIPTION - UPON ENTRY BY ASTRONAUT ACTION, P76 FLASHES DSKY REQUESTS TO THE ASTRONAUT
R5003           TO PROVIDE VIA DSKY (1) THE DELTA V TO BE APPLIED TO THE OTHER VEHICLE STATE VECTOR AND (2) THE
R5005           TIME (TIG) AT WHICH THE OTHER VEHICLE VELOCITY WAS CHANGED BY  EXECUTION OF A THRUSTING MANEUVER. THE
R5007           OTHER VEHICLE STATE VECTOR IS INTEGRATED TO TIG AND UPDATED BY THE ADDITION OF DELTA V (DELTA V HAVING
R5009           BEEN TRANSFORMED FROM LV TO REF COSYS). USING INTEGRVS, THE    PROGRAM THEN INTEGRATES THE OTHER
R5011   VEHICLE STATE VECTOR TO THE STATE VECTOR OF THIS VEHICLE, THUS INSURING THAT THE W-MATRIX AND BOTH VEHICLE
R5013   STATES CORRESPOND TO THE SAME TIME.
R5014   3) ERASABLE INITIALIZATION REQUIRED - NONE.
R5015   4) CALLING SEQUENCES AND EXIT MODES - CALLED BY ASTRONAUT REQUEST THRU DSKY V 37 E 76 E.
R5017           EXITS BY TCF ENDOFJOB.
R5018   5) OUTPUT - OTHER VEHICLE STATE VECTOR INTEGRATED TO TIG AND INCREMENTED BY DELTA V IN REF COSYS.
R5020           THE PUSHLIST CONTAINS THE MATRIX BY WHICH THE INPUT DELTA V MUST BE POST-MULTIPLIED TO CONVERT FROM LV
R5022           TO REF COSYS.
R5023   6) DEBRIS - OTHER VEHICLE STATE VECTOR.
R5024   7) SUBROUTINES CALLED - BANKCALL,GOXDSPF,CSMPREC (OR LEMPREC),ATOPCSM (OR ATOPLEM),INTSTALL,INTWAKE, PHASCHNG
R5026           INTPRET, INTEGRVS, AND MINIRECT.

R5027   8) FLAG USE - NODNFLAG,CMCONFLAG,INTYPFLG,RASFLAG, AND MARKCTR.

 5028                           30,2000                 BANK   30
 5029   REF   1                 13,2000                 SETLOC P76LOC
 5030                           13,2036                 BANK

 5031   REF   1                                         COUNT* $$/P76

 5032   REF  20  LAST  467      E7,1412                 EBANK= TIG

 5033   REF  17  LAST  472      13,2036   0 5435 C  P76 TC     UPFLAG
 5034   REF   2  LAST  252      13,2037    00031 C      ADRES  TRACKFLG

 5035   REF   1                 13,2040   3 2163 1      CAF    V06N84          FLASH LAST DELTA V,
 5040   REF  57  LAST  494      13,2041   0 4555 C      TC     BANKCALL        AND WAIT FOR KEYBOARD ACTION.
 5041   REF  14  LAST  474      13,2042    20624 0      CADR   GOFLASH
 5042   REF   1                 13,2043   1 2155 C      TCF    ENDP76
 5043                           13,2044   0 2046 1      TC     +2              PROCEED
 5044                           13,2045   0 2040 1      TC     -5              STORE DATA AND REPEAT FLASHING
 5045   REF   2  LAST  50C      13,2046   3 2164 C      CAF    V06N84 +1       FLASH VERB 06 NOUN 33, DISPLAY LAST TIG,
 5046   REF  58  LAST  50C      13,2047   0 4555 C      TC     BANKCALL        AND WAIT FOR KEYBOARD ACTION.
 5047   REF  15  LAST  50C      13,2050    20624 0      CADR   GOFLASH
 5048   REF   2  LAST  50C      13,2051   1 2155 C      TCF    ENDP76
 5049                           13,2052   0 2054 1      TC     +2
 5050                           13,2053   0 2046 1      TC     -5
 5051   REF  54  LAST  499      13,2054   0 6006 1      TC     INTPRET         RETURN TO INTERPRETIVE CODE
 5052                           13,2055    77745 1      DLOAD                  SET D(MPAC)=TIG IN CSEC 828
 5053   REF  21  LAST  50C      13,2056    03413 1                TIG
 5054   REF  15  LAST  498      13,2057    34041 C      STCALL TDEC1           SET TDEC1=TIG FOR ORBITAL INTEGRATION
 5055   REF   4  LAST  497      13,2060    27036 1                OTHPREC
 5056                           13,2061    53575 C  COMPMAT VLOAD  UNIT
 5057   REF  11  LAST  49E      13,2062    00001 C                RATT
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5058                          13,2063  77676 C   VCOMP           U(-R)
5059                          13,2064  00031 C   STORE   24D     U(-R) TO 24D
5060                          13,2065  53435 C   VXV     UNIT    U(-R)XV = U(VXR)
5061  REF   8  LAST  498      13,2066  00007 C           VATT
5062                          13,2067  00023 C   STORE   18D
5063                          13,2070  53435 C   VXV     UNIT    U(VXR)XU(-R) = U((RXV)XR)
5064                          13,2071  00031 C           24D
5065                          13,2072  24015 C   STOVL   12D
5066  REF   4  LAST  275      13,2073  03540 C           DELVCV
5067                          13,2074  76505 C   VXM     VSL1    V(MPAC)=DELTA V IN REFCOSYS
5068                          13,2075  00015 C           12D
5069                          13,2076  77655 1   VAD
5070  REF   9  LAST  501      13,2077  00007 C           VATT
5071                          13,2100  00007 C   STORE   6       V(P06)=VATT + DELTA V
5072                          13,2101  77624 1   CALL            PREVENT WOULD-BE USER OF ORBITAL
5073  REF  11  LAST  498      13,2102  27371 1           INTSTALL INTEG FROM INTERFERING WITH UPDATING
5074                          13,2103  77624 1   CALL
5075  REF   1                 13,2104  26165 1           P76SUB1
5076                          13,2105  53775 1   VLOAD   VSR*
5077                          13,2106  00007 C           6
5078                          13,2107  57176 C           0,2
5079  REF   8  LAST  498      13,2110  25543 1   STOVL   VCV
5080  REF  12  LAST  500      13,2111  00001 C           RATT
5081                          13,2112  77657 C   VSR*
5082                          13,2113  57176 C           0,2
5083  REF   8  LAST  498      13,2114  15535 C   STODL   RCV
5084  REF  22  LAST  500      13,2115  03413 1           TIG
5085  REF   8  LAST  498      13,2116  01517 C   STORE   TET
5086                          13,2117  71214 C   CLEAR   DLOAD
5087  REF   7  LAST  498      13,2120  01673 1           INTYPFLG
5088  REF   1                 13,2121  01571 C           TETTHIS
5089  REF  16  LAST  500      13,2122  34041 C INTOTHIS STCALL TDEC1
5090  REF   5  LAST  498      13,2123  27066 1           INTEGRVS
5091                          13,2124  77624 1   CALL
5093  REF  12  LAST  501      13,2125  27371 1           INTSTALL
5094                          13,2126  77775 1   VLOAD
5095  REF   4  LAST  497      13,2127  00017 1           RATT1
5096  REF   2  LAST   82      13,2130  01503 C   STORE   RREC1
5097  REF   9  LAST  501      13,2131  15535 C   STODL   RCV
5098  REF   6  LAST  498      13,2132  00015 C           TAT
5099  REF   9  LAST  501      13,2133  25517 C   STOVL   TET
5100  REF   4  LAST  497      13,2134  00025 C           VATT1
5101                          13,2135  77624 1   CALL
5102  REF   1                 13,2136  23360 C           MINIREC1
5103                          13,2137  77776 1   EXIT
5104  REF  22  LAST  472      13,2140  0 5301 C  TC      PHASCHNG
5105                          13,2141   04024 C  OCT     04024

5106  REF  18  LAST  500      13,2142  0 5435 C  TC      UPFLAG
5107  REF   1                 13,2143   00236 C  ADRES   REINTFLG
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5109  REF  55  LAST  500   13,2144  0 6006 1          TC      INTPRET
5110                       13,2145   77624 1          CALL
5111  REF   1              13,2146   26711 1                  ATOPCTH
5116                       13,2147   77531 C          SSP     EXIT
5117  REF   9  LAST  444   13,2150   00053 1                  QPRET
5118  REF   1              13,2151   26154 C                  OUT
5119  REF  99  LAST  500   13,2152  0 4555 C          TC      BANKCALL      PERMIT USE OF ORBITAL INTEGRATION
5120  REF   1              13,2153   27426 1          CADR    INTWAKE1
5121                       13,2154   77776 1  OUT     EXIT
5125  REF 105  LAST  492   13,2155  3 4714 1  ENDP76  CAF     ZERO
5126  REF   1              13,2156  55'126 1          TS      MARKCTR       CLEAR RR TRACKING MARK COUNTER
51265 REF   4  LAST  272   13,2157  55'125 1          TS      VHFCNT

5127  REF  11  LAST  295   13,2160  3 7716 C          CAF     NEGONE
5128  REF   6  LAST  221   13,2161  55'734 1          TS      MRKBUF2       INVALIDATE MARK BUFFER

5129  REF  12  LAST  474   13,2162  1 4106 C          TCF     GOTOPOOH

5130                       13,2163   01524 C  V06N84  NV      0684
5131                       13,2164   01441 1          NV      0633
5132                       13,2165   43174 1  P76SUB1 AXT,2   SET
5133                       13,2166   00002 C                  2
5134  REF   9  LAST  498   13,2167   00063 1                  MOONFLAG      SET MEANS MOON IS SPHERE OF INFLUENCE.
5135                       13,2170   77014 1          BON     AXT,2
5136  REF   5  LAST  484   13,2171   04303 C                  CMOONFLG      SET MEANS PERM CM STATE IN LUNAR SPHERE.
5137  REF  10  LAST  502   13,2172   00052 C                  QPRET
5138                       13,2173   00000 1                  0
5139                       13,2174   43414 1  CLEAR   RVQ
5140  REF  10  LAST  502   13,2175   00263 C                  MOONFLAG
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P5200   SUBROUTINE NAME:      V82CALL
R5201   MOD NO:  0                                                    DATE:            16 FEB 67
R5203   MOD BY:  RR BAIRNSFATHER                                      LOG SECTION:     R30
R5205   MOD NO: 1              MOD BY: RR BAIRNSFATHER      DATE: 11 APR 67      SR30.1 CHANGED TO ALLOW MONITOR OPERN
R5208   MOD  NO: 2             MOD  BY ALONSO               DATE : 11 DEC 67     V882 PROGRAM REWRITTEN
R52095  MOD NO: 3              MOD  BY ALONSO               DATE: 26 MAR 68      PROG MOD TO HANDLE DIF EARTH/MOON SCALE
R5210    NEW FUNCTIONAL DESCRIPTION:    CALLED BY VERB 82 ENTER.  PRIORITY 10
R5211     USED THROUGHOUT.              CALCULATE AND DISPLAY ORBITAL PARAMETERS

R5212   1. IF AVERAGE G IS OFF:
R5213            FLASH DISPLAY V04N06. R2 INDICATES WHICH SHIP'S STATE VECTOR IS
R5214             TO BE UPDATED. INITIAL CHOICE IS THIS SHIP (R2=1). ASTRONAUT
R5215             CAN CHANGE TO OTHER SHIP BY V22EXE, WHERE X NOT EQ 1.
R5216            SELECTED STATE VECTOR UPDATED BY THISPREC (OTHPREC).
R5217            CALLS SR30.1 (WHICH CALLS TFFCONMU + TFFRP/RA) TO CALCULATE
R5218             RPER (PERIGEE RADIUS), RAPO (APOGEE RADIUS), HPER (PERIGEE
R5219             HEIGHT ABOVE LAUNCH PAD OR LUNAR LANDING SITE), HAPO (APOGEE
R5220             HEIGHT AS ABOVE), TPER (TIME TO PERIGEE), TFF (TIME TO
R5221             INTERSECT 300 KFT ABOVE PAD OR 35KFT ABOVE LANDING SITE).
R5222            FLASH MONITOR V16N44 (HAPO, HPER, TFF).TFF IS -59M59S IF IT WAS
R5223             NOT COMPUTABLE, OTHERWISE IT INCREMENTS ONCE PER SECOND.
R5224             ASTRONAUT HAS OPTION TO MONITOR TPER BY KEYING IN N 32 E.
R5225             DISPLAY IS IN HMS, IS NEGATIVE (AS WAS TFF), AND INCREMENTS
R5226             ONCE PER SECOND ONLY IF TFF DISPLAY WAS -59M59S.

R5227   2. IF AVERAGE G IS ON:
R5228            CALLS SR30.1 APPROX EVERY TWO SECS.  STATE VECTOR IS ALWAYS
R5229             FOR THIS VEHICLE. V82 DOES NOT DISTURB STATE VECTOR.  RESULTS
R5230             OF SR30.1 ARE RAPO, RPER, HAPO, HPER, TPER, TFF.
R5231            FLASH MONITOR V16N44 (HAPO, HPER, TFF).
R5232            IF MODE IS P11, THEN CALL DELRSPL SO ASTRONAUT CAN MONITOR
R5233             RESULTS BY N50E. SPLASH COMPUTATION DONE ONCE PER TWO SECS.


R52331  ADDENDUM: HAPO AND HPER SHOULD BE CHANGED TO READ HAPOX AND HPERX IN THE
R52332            ABOVE REMARKS.

R5234   CALLING SEQUENCE:  VERB 82 ENTER.


R5235   SUBROUTINES CALLED:  SR30.1, GOXDSPF
R5236                        MAYBE - THISPREC , OTHPREC, LOADTIME, DELRSPL
R5237   NORMAL EXIT MODES:  TC ENDEXT

R5238   ALARMS:  NONE

R5239   OUTPUT:  HAPOX    (-29) M
R5240            HPERX    (-29) M
R5241            RAPO     (-29) M EARTH
R52411                    (-27) M MOON
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R5242 RPER (-29) M EARTH
R52421 (-27) M MOON
R5243 TFF (-28) CS CONTAINS NEGATIVE QUANTITY
R5244 -TPER (-28) CS CONTAINS NEGATIVE QUANTITY
R5245 RSP-RREC (-29) M IF DELRSPL CALLED

R5246 ERASABLE INITIALIZATION REQUIRED: STATE VECTOR.

R5247 DEBRIS: QPRET, RCNE, VCNE,TFF/RTMU, HPERMIN, RPADTEM, V82EMFLG.
R5248 MAYBE: TSTART82, V82FLAGS, TDEC1.

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 5249  REF   3  LAST  272    E4,1751                          EBANK= HAPOX
 5250                        31,2021                          BANK   31
 5251  REF   1               23,2000                          SETLOC R30LOC
 5252                        23,2332                          BANK
 5253  REF   1                                                COUNT* $$/R30

 5254  REF  96  LAST  502    23,2332  0 6006 1  V82CALL  TC      INTPRET
 5255                        23,2333   52014 0              BON     GOTO
 5256  REF   1               23,2334   00716 1              AVEGFLAG
 5257  REF   1               23,2335   46566 0              V82GON          IF AVERAGE G ON
 5258  REF   1               23,2336   46337 1              V82GOFF         IF AVERAGE G OFF

 5259                        23,2337    77776 1  V82GOFF  EXIT
 5260  REF  28  LAST  442    23,2340  3 4711 1              CAF     TWO     DESIRED FOR ORBITAL PARAMETERS
 5261  REF   2  LAST  264    23,2341  55'131 1              TS      OPTION1 CALCULATION AND DISPLAY.
 5262  REF  62  LAST  448    23,2342  3 4712 1              CAF     ONE
 5263  REF   3  LAST  504    23,2343  55'132 1              TS      OPTION1 +1
 5264  REF   1               23,2344  3 2406 1              CAF     OPTIONVN        V 04 N 06
 5265  REF 100  LAST  502    23,2345  0 4555 0              TC      BANKCALL
 5266  REF   9  LAST  256    23,2346   20465 1              CADR    GOXDSPF
 5267  REF  23  LAST  496    23,2347  0 5423 1              TC      ENDEXT          TERMINATE
 5268                        23,2350  0 2352 1              TC      +2              PROCEED
 5269                        23,2351  0 2344 0              TC      -5              DATA IN. OPTION1+1 = 1 FOR THIS VEHICLE.
A5270                                                                               UNEQ 1 FOR OTHER VEHICLE.
 5271  REF  24  LAST  494    23,2352  3 4707 0              CAF     BIT4            80 MS
 5272  REF  17  LAST  407    23,2353  0 5140 1              TC      WAITLIST
 5273  REF   4  LAST  273    E4,1743                          EBANK= TFF
 5274  REF   1               23,2354   02531 1              2CADR   TICKTEST
 5274  REF   1               23,2355   46064 1
 5275                        23,2356  0 0003 1              RELINT
 5276  REF   1               23,2357  3 2410 0  V82GOFLP  CAF     TFFBANK         MAJOR RECYCLE LOOP ENTRY
 5277  REF  19  LAST  432    23,2360  54 003 0              TS      EBANK
 5278  REF 106  LAST  502    23,2361  3 4714 1              CAF     ZERO
 5279  REF   3  LAST   88    23,2362  55'742 0              TS      V82FLAGS        ZERO FLAGS FOR TICKTEST. INHIBITS
A5280                                                                               DECREMENTING OF TFF AND -TPER.
 5281  REF   5  LAST  260    23,2363  3 4756 1              CAF     PRIO7
 5282  REF  18  LAST  494    23,2364  0 5042 1              TC      FINDVAC         V82GOFF1 WILL EXECUTE STATE VECTOR
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5283  REF   5  LAST  504   E4,1743                        EBANK= TFF          UPDATE AND ORBIT CALCULATIONS FOR
5284  REF   1              23,2365   02411 1             2CADR  V82GOFF1     SELECTED VEHICLE ABOUT PROPER BODY.
5284  REF   1              23,2366   46064 1
5285                       23,2367   0 0003 1            RELINT
5286  REF  14  LAST  382   23,2370   3 6214 C  V82STALL  CAF    THREE        STALL IN THIS LOOP AND WITHOLD V 16 N 44
5287  REF   4  LAST  504   23,2371   7 1742 C            MASK   V82FLAGS     UNTIL STATE VECTOR UPDATE SETS ONE OF
5288  REF 137  LAST  444   23,2372   10 000 C            CCS    A            OUR FLAG BITS.
5289  REF   1              23,2373   0 2400 1            TC     FLAGGON      EXIT FROM STALL LOOP.
5290  REF   4  LAST  494   23,2374   3 4734 C            CAF    1SEC
5291  REF 101  LAST  504   23,2375   0 4555 C            TC     BANKCALL
5292  REF   4  LAST  494   23,2376    01730 1            CADR   DELAYJOB
5293  REF   1              23,2377   0 2370 1            TC     V82STALL

5294  REF   1              23,2400   3 2407 C  FLAGGON   CAF    V16N44       MONITOR HAPO,HPER,TFF.
5295  REF 102  LAST  505   23,2401   0 4555 C            TC     BANKCALL
5296  REF  10  LAST  504   23,2402    20465 1            CADR   GOXDSPF
5297  REF   3  LAST  494   23,2403   0 5514 1            TC     B5OFF        TERM  THIS TELLS TICKTEST TO KILL ITSELF
5298  REF   4  LAST  505   23,2404   0 5514 1            TC     B5OFF        PROCEED  DITTO
5299  REF   1              23,2405   0 2357 1            TC     V82GOFLP     RECYCLE  RECOMPUTE STATE VECT + DISPLAY

5300                       23,2406    01006 C  OPTIONVN  VN     0406
5301                       23,2407    04054 1  V16N44    VN     1644
5302  REF   6  LAST  505   23,2410    02343 1  TFFBANK   ECADR  TFF

5303  REF  57  LAST  504   23,2411   0 6006 1  V82GOFF1  TC     INTPRET
5304                       23,2412    77634 C             RTB
5305  REF   7  LAST  497   23,2413    45505 C                    LOADTIME
5306  REF  17  LAST  501   23,2414    00041 1             STORE  TDEC1        TIME FOR STATE VECTOR UPDATE.
5307  REF   1              23,2415    02325 1             STORE  TSTART82     TIME FOR INTERNAL USE.
5308                       23,2416    77776 1             EXIT
5309  REF   4  LAST  504   23,2417   4 1132 1             CS     OPTION1 +1   1 FOR THIS VEHICLE, NOT 1 FOR OTHER.
5310  REF  63  LAST  504   23,2420   6 4712 1             AD     ONE
5311                       23,2421   0 0006 1             EXTEND
5312  REF   1              23,2422   1 2446 1             BZF    THISSHIP
5313  REF  58  LAST  505   23,2423   0 6006 1  OTHSHIP   TC     INTPRET
5314                       23,2424    77624 1             CALL                CALL STATE VECTOR UPDATE FOR OTHER SHIP.
5315  REF   5  LAST  500   23,2425    27036 1                    OTHPREC
5316                       23,2426    77775 1  BOTHSHIP  VLOAD               MOVE RESULTS INTO TFFCONIC STORAGE AREAS
5317  REF  13  LAST  501   23,2427    00001 C                    RATT          TO BE CALLED BY SR30.1.
5318  REF  10  LAST  498   23,2430    26327 C             STOVL  RONE         RATT AT (-29)M FOR EARTH OR MOON
5321  REF  10  LAST  501   23,2431    00007 C                    VATT
5322  REF   6  LAST  498   23,2432    02335 C             STORE  VONE          VATT AT (-7)M/CS FOR EARTH OR MOON
5323                       23,2433    77743 1             DLOAD*
5324  REF   1              23,2434    71321 1                    1/RTMUE,2     X2 IS 0 FOR EARTH CENTERED STATE VEC
5325  REF   1              23,2435    00037 C             STORE  TFF/RTMU      X2 IS 2 FOR MOON
5326                       23,2436    77743 1             DLOAD*              AS LEFT BY THISPREC OR OTHPREC.
5327  REF   1              23,2437    71315 C                    MINPERE,2
5328  REF   2  LAST   88   23,2440    02321 C             STORE  HPERMIN        TFFRTMU, HPERMIN AND RPADTEM ARE ALL
5329                       23,2441    46135 1             SLOAD  BHIZ         EARTH/MOON PARAMETERS AS SET HERE.
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5330  REF  5 LAST 487   23,2442   00050 1                    X2
5331  REF  1            23,2443   46463 1                    EARTHPAD
5332                    23,2444   77650 1          GOTO
5333  REF  1            23,2445   46467 C                    MOONPAD

5334  REF 59 LAST 505   23,2446 0 6006 1 THISSHIP TC         INTPRET
5335                    23,2447   77624 1          CALL                  CALL STATE VECTOR UPDATE FOR THIS SHIP.
5336  REF  4 LAST 497   23,2450   27022 1                    THISPREC
5337                    23,2451   77650 1          GOTO
5338  REF  1            23,2452   46426 C                    BOTHSHIP

R5339 THE FOLLOWING CONSTANTS ARE PAIRWISE INDEXED. DO NOT SEPARATE PAIRS.

5340                    23,2453   27533 1 1/RTMUM  2DEC*     .45162595 E-4 B14*
5340                    23,2454   07571 C
5341                    23,2455   25004 1 1/RTMUE  2DEC*     .50087529 E-5 B17*
5341                    23,2456   06702 1
5342                    23,2457   00001 0 MINPERM  2DEC      10668 B-27        35 KFT MIN PERIGEE HEIGHT FOR MOON(-27)M
5342                    23,2460   11530 1
5343                    23,2461   00002 C MINPERE  2DEC      91440 B-29        300 KFT (-29)M FOR EARTH
5343                    23,2462   31230 1

5344                    23,2463   43145 C EARTHPAD DLOAD     CLRGO              PAD 37-8 RADIUS.  SCALED AT (-29)M.
5345  REF  2 LAST 487   23,2464   05311 1                    RPAD
5346  REF  1            23,2465   04622 C                    V82EMFLG           INDICATE EARTH SCALING FOR SR30.1
5346  REF  1            23,2466   46473 C                    BOTHPAD

5347                    23,2467   51575 1 MOONPAD  VLOAD     ABVAL             COMPUTE MOON PAD RADIUS FROM RLS VECTOR.
5348  REF  3 LAST 487   23,2470   02026 1                    RLS                SCALED AT (-27)M.
5349                    23,2471   77614 1          SET
53491 REF  2 LAST 506   23,2472   04462 C                    V82EMFLG           INDICATE MOON  SCALING FOR SR30.1
5350  REF  2 LAST  88   23,2473   36323 C BOTHPAD  STCALL    RPADTEM
5352  REF  1            23,2474   46667 1                    SR30.1            CALCULATE ORBITAL PARAMETERS
53521                   23,2475   77776 1          EXIT
53522 REF  9 LAST 474   23,2476 3 1011 C          CA         MODREG            ARE WE IN PCO
53523                   23,2477   0 0006 1         EXTEND
53524 REF  1            23,2500   1 2645 C         BZF        CANDEL            YES, DO DELRSPL
53525 REF 60 LAST 506   23,2501   0 6006 1 SPLRET1 TC         INTPRET
5353                    23,2502   45234 C          RTB        DSU
5354  REF  8 LAST 505   23,2503   45505 C                     LOADTIME
5356  REF  2 LAST 505   23,2504   02325 1                     TSTART82          PRESENT TIME - TIME V82GOFFI BEGAN
5357  REF  3 LAST 506   23,2505   02325 1          STORE      TSTART82                        SAVE IT
5358                    23,2506   53145 1          DLOAD      BZE               SR30.1 SETS -TPER=0 IF HPER L/
5359  REF  3 LAST 265   23,2507   02346 1                     -TPER              HPERMIN (300 OR 35) KFT.
5360  REF  1            23,2510   46521 C                     TICKTFF           (-TPER = 0)
5361                    23,2511   43345 1 TICKTPER DLOAD     DAD               (-TPER NON ZERO)  TFF WAS NOT COMPUTED,
5362  REF  4 LAST 506   23,2512   02346 1                     -TPER             BUT WAS SET TO 59M59S.DONT TICK TFF, DO
5363  REF  4 LAST 506   23,2513   02325 1                     TSTART82          TICK -TPER. DISPLAY BOTH.
5364  REF  5 LAST 506   23,2514   02346 1          STORE      -TPER             -TPER CORRECTED FOR TIME SINCE V82GOFFI
5365                    23,2515   77776 1          EXIT                         BEGAN.
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5366  REF  37  LAST  473   23,2516  3 4712 1          CAF     BIT1
5367  REF   5  LAST  505   23,2517  55'742 0          TS      V82FLAGS    INFORMS TICKTEST TO INCREMENT ONLY -TPER
5368  REF  58  LAST  473   23,2520  0 5112 0          TC      ENDOFJOB

5369                        23,2521   43345 1 TICKTFF DLOAD   DAD         (-TPER=0)  TFF WAS COMPUTED.TICK TFF.
5370  REF   7  LAST  505   23,2522   02344 0          TFF                 DO NOT TICK -TPER.DISPLAY TFF, BUT NOT
5371  REF   5  LAST  506   23,2523   02325 1          TSTART82            -TPER.
5372  REF   8  LAST  507   23,2524   02344 0          STORE   TFF         TFF CORRECTED FOR TIME SINCE V82GOFF1
5373                        23,2525   77776 1          EXIT                BEGAN.
5374  REF  22  LAST  448   23,2526  3 4711 1          CAF     BIT2
5375  REF   6  LAST  507   23,2527  55'742 0          TS      V82FLAGS    INFORMS TICKTEST TO INCREMENT ONLY TFF.
5376  REF  59  LAST  507   23,2530  0 5112 0          TC      ENDOFJOB

5377  REF  27  LAST  495   23,2531  3 4706 1 TICKTEST CAF     BIT5        THIS WAITLIST PROGRAM PERPETUATES ITSELF
5378  REF  13  LAST  496   23,2532  7 1044 1          MASK    EXTVBACT    ONCE A SEC UNTIL BIT 5 OF EXTVBACT =0.
5379  REF 138  LAST  505   23,2533  10 000 0          CCS     A
5380  REF   1               23,2534  0 2542 0          TC      DOTICK
5381  REF   1               23,2535  3 7662 1          CAF     PRIO25
5382  REF  15  LAST  378   23,2536  0 5027 1          TC      NOVAC       TERMINATE V 82.CANT CALL ENDEXT IN RUPT.
5383  REF  14  LAST  507      1044                    EBANK=  EXTVBACT
5384  REF  24  LAST  504   23,2537   05423 1          2CADR   ENDEXT
5384                        23,2540   04062 1
5385  REF  21  LAST  428   23,2541  0 5213 1          TC      TASKOVER

5386  REF   5  LAST  505   23,2542  3 4734 0 DOTICK   CAF     1SEC        RE-REQUEST TICKTEST.
5387  REF  18  LAST  504   23,2543  0 5140 1          TC      WAITLIST
5388  REF   9  LAST  507   E4,1743                   EBANK=  TFF
5389  REF   2  LAST  504   23,2544   02531 1          2CADR   TICKTEST
5389                        23,2545   46064 1
5390  REF  15  LAST  505   23,2546  3 6214 0          CAF     THREE
5391  REF   7  LAST  507   23,2547  7 1742 0          MASK    V82FLAGS
5392  REF 139  LAST  507   23,2550  50 000 1          INDEX   A
5393                        23,2551  0 2552 1          TC      +1
5394  REF  22  LAST  507   23,2552  0 5213 1          TC      TASKOVER    IF NO FLAGBITS SET DONT CHANGE TFF OR
A5395                                                                   -TPER, BUT CONTINUE LOOP.
5396  REF   1               23,2553  0 2561 1          TC      TPERTICK    ONLY BIT 1 SET. INCR -TPER BY 1 SEC.
5397  REF   6  LAST  507   23,2554  3 4734 0 TFFTICK  CAF     1SEC        ONLY BIT 2 SET. INCR TFF BY 1 SEC.
5398  REF  58  LAST  493   23,2555  54 001 1          TS      L
5399  REF 107  LAST  504   23,2556  3 4714 1          CAF     ZERO
5400  REF  10  LAST  507   23,2557  21'744 0          DAS     TFF
5401  REF  23  LAST  507   23,2560  0 5213 1          TC      TASKOVER
5402  REF   7  LAST  507   23,2561  3 4734 0 TPERTICK CAF     1SEC
5403  REF  59  LAST  507   23,2562  54 001 1          TS      L
5404  REF 108  LAST  507   23,2563  3 4714 1          CAF     ZERO
5405  REF   6  LAST  506   23,2564  21'746 1          DAS     -TPER
5406  REF  24  LAST  507   23,2565  0 5213 1          TC      TASKOVER
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 5407                                23,2566   77776 1  V82CON   EXIT                AVERAGE G ON. USE CURRENT STATE VECTOR
A5408                                                                                FOR ORBITAL PARAMETER CALCULATIONS.
 5409  REF   6  LAST  504   23,2567  3 4756 1           CAF      PRIO7               LESS THAN LAMBERT
 5410  REF  19  LAST  504   23,2570  0 5042 1           TC       FINDVAC             V82GON1 WILL PERFORM ORBIT CALCULATIONS
 5411  REF  11  LAST  507   E4,1743                     EBANK=   TFF                 ABOUT PROPER BODY APPROX ONCE PER SEC.
 5412  REF   1               23,2571   02604 1          2CADR    V82GON1
 5412  REF   1               23,2572   46064 1
 5413                        23,2573   0 0003 1         RELINT
 5414  REF   3  LAST  419   23,2574   10 067 1          CCS      NEWJOB              WITHOLD V16 N44 UNTIL FIRST ORBIT CALC
 5415  REF   2  LAST  419   23,2575   0 5057 0          TC       CHANG1              IS DONE. NOTE: V82GON1 (PRIO7, FINDVAC
A5416                                                                                JOB) IS COMPLETED BEFORE V82GON (PRIO7,
A54161                                                                               NOVAC JOB).
 5417  REF   2  LAST  505   23,2576  3 2407 0  V82REDSP CAF      V16N44              MONITOR HAPO, HPER, TFF
 5418  REF 103  LAST  505   23,2577  0 4555 0          TC       BANKCALL
 5419  REF  11  LAST  505   23,2600   20465 1          CADR     GOXDSPF
 5420  REF   5  LAST  505   23,2601  0 5514 1          TC       B5OFF               TERM THIS TELLS V82GON1 TO KILL ITSELF.
 5421  REF   6  LAST  508   23,2602  0 5514 1          TC       B5OFF               PROC DITTO.
 5422  REF   1               23,2603  0 2576 1          TC       V82REDSP            RECYCLE

 5423  REF  61  LAST  506   23,2604  0 6006 1  V82GON1  TC       INTPRET             THIS EXEC PROGRAM PERPETUATES ITSELF
A5424                                                                                ONCE A SEC UNTIL BIT 5 OF EXTVBACT =0.
 5425                        23,2605   52175 0          VLOAD    GOTO                HOLDS OFF CCS NEWJOB BETWEEN RN AND
 5426  REF   6  LAST  498   23,2606   01171 1                   RN                    VN FETCH SO RN , VN ARE FROM SAME
 5427  REF   1               23,2607   46610 1                   NEXTLINE              STATE VECTOR UPDATE.
 5428  REF  11  LAST  505   23,2610   26327 0  NEXTLINE STOVL    RONE                  RN AT (-29)M FOR EARTH OR MOON
 5429  REF   6  LAST  498   23,2611   01177 1                   VN
 5430  REF   7  LAST  505   23,2612   02335 0          STORE    VONE                VN AT (-7)M/CS FOR EARTH OR MOON
 5431                        23,2613   52014 0          BON      GOTO
 5432  REF   6  LAST  498   23,2614   04303 0                   MOONTHIS            FLAG INDICATES BODY ABOUT WHICH ORBITAL
 5433  REF   1               23,2615   46617 0                   MOONGON               CALCULATIONS ARE TO BE PERFORMED.
 5434  REF   1               23,2616   46630 0                   EARTHGON              IF SET - MOON , IF RESET - EARTH.

 5435                        23,2617   71214 0  MOONGON  SET      DLOAD
 5436  REF   3  LAST  506   23,2620   04462 0                   V82EMFLG            INDICATE MOON SCALING FOR SR30.1
54361  REF   1               23,2621   06454 1                   1/RTMUM             LUNAR PARAMETERS LOADED HERE FOR SR30.1
 5437  REF   2  LAST  505   23,2622   14037 0          STODL    TFF/RTMU
 5438  REF   1               23,2623   06460 0                   MINPERR
 5439  REF   3  LAST  505   23,2624   26321 0          STOVL    HPERMIN
 5441  REF   4  LAST  506   23,2625   02026 1                   RLS                 SCALED AT (-27)M.
 5443                        23,2626   52046 1          ABVAL    GOTO
 5444  REF   1               23,2627   46637 1                   V82GON2
 5445                        23,2630   71214 0  EARTHGON CLEAR    DLOAD
 5446  REF   4  LAST  508   23,2631   04662 1                   V82EMFLG            INDICATE EARTH SCALING FOR SR30.1
54461  REF   2  LAST  505   23,2632   06456 0                   1/RTMUE             EARTH PARAMETERS LOADED HERE FOR SR30.1
 5447  REF   3  LAST  508   23,2633   14037 0          STODL    TFF/RTMU
 5448  REF   2  LAST  505   23,2634   06462 1                   MINPERE
 5449  REF   4  LAST  508   23,2635   16321 0          STODL    HPERMIN
 5450  REF   3  LAST  506   23,2636   05311 1                   RPAD
 5451  REF   3  LAST  506   23,2637   36323 0  V82GON2  STCALL   RPADTEM             COMMON CODE FOR EARTH & MOON.
 5453  REF   2  LAST  506   23,2640   46667 1                   SR30.1
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5454                                23,2641   77776 1                EXIT
5455   REF   9  LAST  415           23,2642   0 5253 0               TC      CHECKMM
5456                                23,2643   00013 0                DEC     11
5457   REF   1                      23,2644   0 2657 1               TC      V82GOON3        NOT IN MODE 11.
5458   REF  62  LAST  508           23,2645   0 6006 1      CANDEL   TC      INTPRET         IN MODE 11 OR 00
54581                               23,2646   77624 1                CALL
54582  REF  13  LAST  501           23,2647   27371 1                        INTSTALL        DELRSPL DOES INTWAKE
5459                                23,2650   45145 0                DLOAD   CALL
5460   REF  12  LAST  508           23,2651   02344 0                        TFF
5461   REF   1                      23,2652   64017 0                        DELRSPL         RETURN IS TO NEXT LINE ( SPLRET ).
5462                                23,2653   77776 1      SPLRET    EXIT

54621  REF  10  LAST  506           23,2654   3 1011 0               CA      MODREG
54622                               23,2655   0 0006 1               EXTEND
54623  REF   1                      23,2656   1 2501 0               BZF     SPLRET1
5463   REF  28  LAST  507           23,2657   3 4706 1      V82GOON3  CAF     BIT5
5464   REF  15  LAST  507           23,2660   7 1044 1               MASK    EXTVBACT        SEE IF ASTRONAUT HAS SIGNALLED TERMINATE
5465                                23,2661   0 0006 1               EXTEND
5466   REF  25  LAST  507           23,2662   1 5423 0               BZF     ENDEXT          YES, TERMINATE V8 82 LOOP
5468   REF   8  LAST  507           23,2663   3 4734 0               CAF     1SEC
5469   REF 104  LAST  508           23,2664   0 4555 0               TC      BANKCALL        WAIT ONE SECOND BEFORE REPEATING
5470   REF   5  LAST  505           23,2665    01730 1               CADR    DELAYJOB          ORBITAL PARAMETER COMPUTATION.
5471   REF   2  LAST  508           23,2666   0 2604 1               TC      V82GOON1
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L R30 USER'S PAGE NO. 8 E4 S3

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P5548   SUBROUTINE NAME:     SR30.1
R5549   MOD NO:  0                                                  DATE:          16 FEB 67
R5551   MOD BY:  RR BAIRNSFATHER                                    LOG SECTION:   R32
R5553   MOD NO:  1          MOD BY:  RR BAIRNSFATHER    DATE: 11 APR 67   SR30.1 CHANGED TO ALLOW MONITOR OPERN
R5555   MOD NO:  2          MOD BY:  RR BAIRNSFATHER    DATE:  14 APR 67  ADD OVFL CK FOR RAPO
R5557   MOD NO:  3          MOD BY ALONSO               DATE: 11 DEC 67   SUBROUTINE REWRITTEN
R55585  MOD NO: 4           MOD BY ALONSO               DATE: 26 MAR 68   PROG MOD TO HANDLE DIF EARTH/MOON SCALE
R5559   MOD NO:  5          MOD BY:  RR BAIRNSFATHER    DATE:  6 AUG 68   OVFL CK FOR HAPO & HPER.VOIDS MOD #2.
R5561

R5562   NEW FUNCTIONAL DESCRIPTION:     ORBITAL PARAMETERS DISPLAY FOR NOUNS 32  AND 44.
R5564   SR30.1 CALLS TFFCONMU AND TFFRP/RA TO CALCULATE RPER (PERIGEE RADIUS),
R5565   RAPO (APOGEE RADIUS), HPER (PERIGEE HEIGHT ABOVE LAUNCH PAD OR LUNAR
R5566   LANDING SITE), HAPO (APOGEE HEIGHT AS ABOVE), TPER (TIME TO PERIGEE),
R5567   TFF (TIME TO INTERSECT 300 KFT ABOVE PAD OR 35KFT ABOVE LANDING SITE).
R5568   IF HPER IS GREATER THAN OR EQUAL TO HPERMIN, CALCULATES TPER AND STORES
R5569   NEGATIVE    IN -TPER. OTHERWISE STORES +0 IN -TPER. WHENEVER TPER IS
R5570   CALCULATED, TFF IS NOT COMPUTABLE AND DEFAULTS TO -59MIN 59SEC. IF HAPO
R5571   WOULD EXCEED 9999.9 NM, IT IS LIMITED TO THAT VALUE FOR DISPLAY.

R5572   ADDENDUM: HAPO AND HPER SHOULD BE CHANGED TO READ HAPOX AND HPERX IN THE
R5573             ABOVE REMARKS.

R5574   CALLING SEQUENCE:          CALL
R5575                              SR30.1
R5576   SUBROUTINES CALLED:        TFFCONMU, TFFRP/RA, CALCTPER, CALCTFF
R5577   NORMAL EXIT MODE:          CALLING LINE +1 (STILL IN INTERPRETIVE MODE)
R5578   ALARMS:                    NONE
R5579   OUTPUT:  RAPO    (-29) M EARTH   APOGEE RADIUS    EARTH CENTERED COORD.
R5580                    (-27) M MOON                     MOON CENTERED COORD.
R5581            RPER    (-29) M EARTH   PERIGEE RADIUS   EARTH CENTERED COORD.
R5582                    (-27) M MOON                     MOON  CENTERED COORD.
R5583            HAPOX   (-29) M         APOGEE ALTITUDE ABOVE PAD OR LAND. SITE MAX VALUE LIMITED TO 9999.9 NM.
R5585            HPERX   (-29) M         PERIGEE ALT. ABOVE PAD OR LAND. SITE    MAX VALUE LIMITED TO 9999.9 NM.
R5587            TFF     (-28) CS        TIME TO 300KFT OR 35KFT ALTITUDE
R5588            -TPER   (-28) CS        TIME TO PERIGEE
R5589   ERASABLE INITIALIZATION REQUIRED-
R5590            TFF/RTMU (+17) EARTH    RECIPROCAL OF PROPER GRAV CONSTANT FOR
R5591                     (+14) MOON     EARTH OR MOON = 1/SQRT(MU).
R5592            RONE    (-29) M         STATE VECTOR
R5593            VONE    (-7)  M/CS      STATE VECTOR
R5594            RPADTEM (-29) M EARTH   RADIUS OF LAUNCH PAD OR LUNAR LANDING
R5595                    (-27) M MOON    SITE.
R5596            HPERMIN (-29) M EARTH   (300 OR 35)KFT MINIMUM PERIGEE ALTITUDE
R5597                    (-27) M MOON    ABOVE LAUNCH PAD OR LUNAR LANDING SITE.
R5598            V82EMFLG (INT SW BIT) RESET FOR EARTH, SET FOR MOON.

R5599   DEBRIS:  QPRET, POLY, S2
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 5600   REF   1                                          COUNT* $$/SR30S

 5601                        23,2667   44001 C  SR30.1  SETPD  STQ        INITIALIZE PUSHDOWN LIST.
 5602                        23,2670   00001 C                 0
 5603   REF   4  LAST  44C   23,2671   00051 C                 S2
A5604                                                          SR30.1 INPUT: RONE AT (-29)M EARTH/MOON
A5605                                                                        VONE AT (-7)M/CS
A5606                                                          TFFCONMU,TFFRP/RA,CALCTPER AND CALCTFF
A5607                                                          CALLS REQUIRE :
A5608                                                          EARTH CENTERED (NO RESCALING REQUIRED)
A5609                                                                        RONE SCALED TO B-29 M
A561C                                                                       VONE SCALED TO B-7 M/CS
A5611                                                          MOON CENTERED  (RESCALING REQUIRED)
A5612                                                                       RONE SCALED TO B-27 M
A5613                                                                       VONE SCALED TO B-5  M/CS
 5614                        23,2672   77214 C                 BOFF   VLOAD
 5615   REF   5  LAST  508   23,2673   04742 1                 V82EMFLG    OFF FOR EARTH ,  ON FOR MOON.
 5616   REF   1               23,2674   46703 1                 TFFCALLS
 5617   REF  12  LAST  508   23,2675   02327 C                 RONE
 5618                        23,2676   77752 1                 VSL2
 5619   REF  13  LAST  511   23,2677   26327 C                 STOVL  RONE
 5620   REF   8  LAST  508   23,2700   02335 C                 VONE
 5621                        23,2701   77752 1                 VSL2
 5622   REF   9  LAST  511   23,2702   02335 C                 STORE  VONE
 5623                        23,2703   77624 1  TFFCALLS CALL
 5624   REF   1               23,2704   56722 C                         TFFCONMU
 5625                        23,2705   77624 1          CALL           TFFRP/RA COMPUTES RAPO,RPER.
 5626   REF   1               23,2706   56770 1                         TFFRP/RA
A5627                                                                  RETURNS WITH RAPO IN D(MPAC).
 5628                        23,2707   77625 C          DSU
 5629   REF   4  LAST  508   23,2710   02323 1                         RPADTEM
 5630                        23,2711   64414 1          BOFF   SR2R    NEED HAPO AT (-29)M FOR DISPLAY.
A5631                                                                  IF MCON CENTERED, RESCALE FROM (-27)M.
A5632                                                                   IF EARTH CENTERED ALREADY AT (-29)M.
 5633   REF   6  LAST  511   23,2712   04742 1                         V82EMFLG    OFF FOR EARTH , ON FOR MOON.
 5634                        23,2713   46714 1                         +1
 5635                        23,2714   77624 1          CALL           IF HAPO > MAXNM, SET HAPO =9999.9 NM.
 5636   REF   1               23,2715   46754 C                         MAXCHK      OTHERWISE STORE (RAPO-RPADTEM) IN HAPO.
 5637   REF   4  LAST  504   23,2716   16352 1  STORHAPO STODL  HAPOX
 5638   REF   1               23,2717   00017 1                         RPER
 5639                        23,2720   77625 C          DSU
 5640   REF   5  LAST  511   23,2721   02323 1                         RPADTEM     GIVES HPER AT (-29)M EARTH, (-27)M MOON.
 5641   REF 238  LAST  492   23,2722   00161 1          STORE  MPAC +4 SAVE THIS FOR COMPARISON TO HPERMIN.
 5642                        23,2723   64414 1          BOFF   SR2R    NEED HPER AT (-29)M FOR DISPLAY.
A5643                                                                  IF MCON CENTERED, RESCALE FROM (-27)M.
A5644                                                                  IF EARTH CENTERED ALREADY AT (-29)M.
 5645   REF   7  LAST  511   23,2724   04742 1                         V82EMFLG    OFF FOR EARTH,  ON FOR MOON.
 5646                        23,2725   46726 C                         +1
 5647                        23,2726   77624 1          CALL           IF HPER > MAXNM, SET HPER = 9999.9 NM.
 5648   REF   2  LAST  511   23,2727   46754 C                         MAXCHK
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5649  REF   4  LAST  273   23,2730   16354 1  STORHPER STODL  HPERX          STORE (RPER - RPADTEM) INTO HPERX.
5650  REF 239  LAST  511   23,2731   00161 1                   MPAC +4
5651                       23,2732   51025 1           DSU     BPL           HPERMIN AT (-29)M FOR EARTH, (-27)M MOON
5652  REF   5  LAST  508   23,2733   02321 C                   HPERMIN       IF HPER L/   HPERMIN (300 OR 35)KFT,
5653  REF   1              23,2734   46740 C                   DOTPER         THEN ZERO INTO -TPER.
5654                       23,2735   52145 C           DLOAD   GOTO           OTHERWISE CALCULATE TPER.
5655  REF   1              23,2736   15332 1                   HI6ZEROS
5656  REF   1              23,2737   46744 1                   SKIPTPER
5657                       23,2740   45145 C  DOTPER   DLOAD   CALL
5658  REF   2  LAST  511   23,2741   00017 1                   RPER
5659  REF   1              23,2742   57026 1                   CALCTPER
5660                       23,2743   77676 C           DCOMP                 TPER IS PUT NEG INTO -TPER.
5661  REF   7  LAST  507   23,2744   16346 1  SKIPTPER STODL  -TPER
5662  REF   6  LAST  512   23,2745   02321 C                   HPERMIN       HPERMIN AT (-29)M FOR EARTH, (-27)M MOON
5663                       23,2746   45015 1           DAD     CALL
5664  REF   6  LAST  511   23,2747   02323 1                   RPADTEM       RPADTEM AT (-29)M FOR EARTH, (-27)M MOON
5665  REF   1              23,2750   57031 1                   CALCTFF       GIVES 59M59S FOR TFF IF RPER G/
5666                       23,2751   77676 C           DCOMP                   HPERMIN + RPADTEM. (TPER WAS NON ZERO)
5667  REF  13  LAST  509   23,2752   36344 1           STCALL  TFF           OTHERWISE COMPUTES TFF.       (GOTO)
5668  REF   5  LAST  511   23,2753   00051 C                   S2

5669                       23,2754   51025 1  MAXCHK   DSU     BPL           IF C(MPAC) > 9999.9 NM, MPAC = 9999.9 NM
5670  REF   1              23,2755   06764 1                   MAXNM
5671                       23,2756   46761 C                   +3            OTHERWISE C(MPAC) = B(MPAC).
5672                       23,2757   43415 C           DAD     RVQ
5673  REF   2  LAST  512   23,2760   06764 1                   MAXNM
5674                       23,2761   43545 1  +3       DLOAD   RVQ                   (USED BY P30 - P37 ALSO)
5675  REF   3  LAST  512   23,2762   06764 1                   MAXNM

5676                       23,2763   01065 C  MAXNM    2OCT    01065 05603
5676                       23,2764   05603 1
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L R30 USER'S PAGE NO. 11 E4 S3

L STABLE ORBIT - P38-P39 USER'S PAGE NO. 1 EO S3

R0001 STABLE ORBIT RENDEZVOUS PROGRAMS (P38 AND P78)

R0002 MCC NC -1 LOG SECTION - STABLE ORBIT - P38-P39
R0003 MCC BY RLONICKI.S DATE 25JAN68

R0004 FUNCTIONAL DESCRIPTION

R0005 P38 AND P78 CALCULATE THE REQUIRED DELTA V AND OTHER INITIAL
R0006 CONDITIONS REQUIRED BY THE AGC TO (1) PUT THE ACTIVE VEHICLE
R0007 ON A TRANSFER TRAJECTORY THAT INTERCEPTS THE PASSIVE VEHICLE
R0008 ORBIT A GIVEN DISTANCE, DELTA R, EITHER AHEAD OF OR BEHIND THE
R0009 PASSIVE VEHICLE AND (2) ACTUALLY PLACE THE ACTIVE VEHICLE IN THE
R0010 PASSIVE VEHICLE ORBIT WITH A DELTA R SEPARATION BETWEEN THE TWO
R0011 VEHICLES

R0012 CALLING SEQUENCE

R0013 ASTRONAUT REQUEST THRU DSKY

R0014 V37E38E IF THIS VEHICLE IS ACTIVE VEHICLE
R0015 V37E78E IF OTHER VEHICLE IS ACTIVE VEHICLE

R0016 INPUT

R0017 (1) SOI MANEUVER

R0018 (A) TIG TIME OF SOI MANEUVER
R0019 (B) CENTANG ORBITAL CENTRAL ANGLE OF THE PASSIVE VEHICLE
R0020 DURING TRANSFER FROM TIG TO TIME OF INTERCEPT
R0021 (C) DELTAR THE DESIRED SEPARATION OF THE TWO VEHICLES
R0022 SPECIFIED AS A DISTANCE ALONG THE PASSIVE VEHICLE
R0023 ORBIT
R0024 (D) OPTION EQUALS 1 FOR SOI

R0025 (2) SOR MANEUVER

R0026 (A) TIG TIME OF SOR MANEUVER
R0027 (B) CENTANG AN OPTIONAL RESPECIFICATION OF 1 (B) ABOVE
R0028 (C) OPTION EQUALS 2 FOR SOR
R0029 (D) DELTTIME THE TIME REQUIRED TO TRAVERSE DELTA R WHEN
R0030 TRAVELING AT A VELOCITY EQUAL TO THE HORIZONTAL
R0031 VELOCITY OF THE PASSIVE VEHICLE - SAVED FROM
R0032 SOI PHASE
R0033 (E) TINT TIME OF INTERCEPT (SOI) - SAVED FROM SOI PHASE

R0034 OUTPUT

R0035 (1) TRKMKCNT NUMBER OF MARKS
R0036 (2) TTOGO TIME TO GO
R0037 (3) +MGA MIDDLE GIMBAL ANGLE

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R0038          (4) DSPTEM1  TIME OF INTERCEPT OF PASSIVE VEHICLE ORBIT
R0039                       (FOR SOI ONLY)
R0040          (5) HOSTTPI  PERIGEE ALTITUDE OF ACTIVE VEHICLE ORBIT AFTER
R0041                       THE SOI (SOR) MANEUVER
R0042          (6) DELVTPI  MAGNITUDE OF DELTA V AT SOI (SOR) TIME
R0043          (7) DELVTPF  MAGNITUDE OF DELTA V AT INTERCEPT TIME
R0044          (8) DELVLVC  DELTA VELOCITY AT SOI (AND SOR) - LOCAL VERTICAL
R0045                       COORDINATES

R0046    SUBROUTINES USED

R0047          AVFLAGA
R0048          AVFLAGP
R0049          VNDSPLY
R0050          BANKCALL
R00502         GOFLASHR
R00504         GOTOPOOH
R00506         BLANKET
R00508         ENDOFJOB
R0051          PREC/TT
R0052          SELECTMU
R0053          INTRFVP
R0054          MAINFTNE
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0055                        04,3103                 BANK    04
0056   REF   1              04,2000                 SETLOC  STBLEORB
0057                        04,3103                 BANK

0058   REF   13  LAST  494  E4,1770                 EBANK=  SUBEXIT
0059   REF   1                                     COUNT*  $$/P3879

0060   REF 105  LAST  509  04,3103  0 4555 C  P38  TC      BANKCALL
0061   REF   3  LAST  458  04,3104   73726 C       CADR    AVFLAGA         THIS VEHICLE ACTIVE
0062                        04,3105  0 3110 1       TC      +3
0063   REF 106  LAST  515  04,3106  0 4555 C  P78  TC      BANKCALL
0064   REF   3  LAST  458  04,3107   73741 1       CADR    AVFLAGP         OTHER VEHICLE ACTIVE
00645  REF 107  LAST  515  04,3110  0 4555 C       TC      BANKCALL
00646  REF   3  LAST  458  04,3111   73746 C       CADR    P20FLGON        SET UPDATFLG, TRACKFLG
0065   REF   1              04,3112  3 3435 C       CAF     V06N33SR        DISPLAY TIG
0066   REF   1              04,3113  0 3424 C       TC      VNDSPLY
0067   REF   1              04,3114  3 3436 C       CAF     V06N55SR        DISPLAY CENTANG
0068   REF 108  LAST  515  04,3115  0 4555 C       TCR     BANKCALL
0069   REF   2  LAST  473  04,3116   20763 1       CADR    GOFLASHR
00694  REF  13  LAST  502  04,3117  1 4106 C       TCF     GOTOPOOH        TERMINATE
00696                       04,3120  1 3125 C       TCF     +5              PROCEED
00698                       04,3121  1 3114 1       TCF     -5              RECYCLE
0070   REF  16  LAST  507  04,3122  3 6214 C       CAF     THREE           IMMEDIATE RETURN - BLANK R1, R2
00702  REF   2  LAST  473  04,3123  0 5415 1       TCR     BLANKET
00704  REF  60  LAST  507  04,3124  1 5112 1       TCF     ENDOFJOB
0071   REF   8  LAST  416  04,3125  3 4715 C       CAF     FIVE
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0072   REF    5  LAST  505   04,3126  55'131 1          TS      OPTICN1
0073   REF   64  LAST  505   04,3127  3 4712 1          CAF     ONE
0074   REF    4  LAST  448   04,3130  55'132 1          TS      OPTICN2     OPTION CODE IS SET TO 1
00742  REF    1              04,3131  3 3437 1          CAF     V04NC6SR    DISPLAY OPTION CODE - 1 = SOI, 2 = SOR
00744  REF  109  LAST  515   04,3132  0 4555 C          TCR     BANKCALL
00746  REF    3  LAST  515   04,3133   20763 1          CADR    GOFLASHR
00748  REF   14  LAST  515   04,3134  1 4106 C          TCF     GOTOPOOH    TERMINATE
0075                         04,3135  1 3142 1          TCF     +5          PROCEED
00752                        04,3136  1 3131 C          TCF     -5          RECYCLE
0076   REF   16  LAST  367   04,3137  3 4710 C          CAF     BIT3        IMMEDIATE RETURN - BLANK R3
0077   REF    3  LAST  515   04,3140  0 5415 1          TCR     BLANKET
0078   REF   61  LAST  515   04,3141  1 5112 1          TCF     ENDOFJOB
0079   REF   63  LAST  509   04,3142  0 6006 1          TC      INTPRET
0080                         04,3143   70535 C          SLOAD   SR1
0081   REF    5  LAST  516   04,3144   01133 1                  OPTICN2
0082                         04,3145   71230 C          BHIZ    DLOAD
0083   REF    1              04,3146   11154 1                  OPTN1
0084   REF    1              04,3147   03656 1                  TINT
0085   REF    1              04,3150   02611 C          STORE   TINTSOI     STORE FOR SCR PHASE
0086                         04,3151   77614 1          CLRGO
0087   REF    1              04,3152   01230 1                  OPTNSW      OPTNSW; ON = SOI, OFF = SOR
0088   REF    1              04,3153   11200 C                  JUNCTN1
0089                         04,3154   45014 C  OPTN1   SET     CALL        SOI
0090   REF    2  LAST  516   04,3155   01070 1                  OPTNSW
0091   REF    1              04,3156   11357 C                  PREC/TT
0092                         04,3157   77615 C          DAD
0093   REF   23  LAST  501   04,3160   03413 1                  TIG
0094   REF    2  LAST  516   04,3161   03656 1          STORE   TINT        TI = TIG + TF
0095   REF   31  LAST  449   04,3162   01046 1          STORE   DSPTEM1     FOR DISPLAY
0096                         04,3163   77776 1          EXIT
00962  REF    1              04,3164  3 3440 1          CAF     V06N57SR    DISPLAY DELTA R
00964  REF  110  LAST  516   04,3165  0 4555 C          TCR     BANKCALL
00966  REF    4  LAST  516   04,3166   20763 1          CADR    GOFLASHR
00968  REF   15  LAST  516   04,3167  1 4106 C          TCF     GOTOPOOH    TERMINATE
0097                         04,3170  1 3175 C          TCF     +5          PROCEED
00972                        04,3171  1 3164 C          TCF     -5          RECYCLE
0098   REF   18  LAST  499   04,3172  3 6211 C          CAF     SIX         IMMEDIATE RETURN - BLANK R2, R3
0099   REF    4  LAST  516   04,3173  0 5415 1          TCR     BLANKET
0100   REF   62  LAST  516   04,3174  1 5112 1          TCF     ENDOFJOB
0101   REF    1              04,3175  3 3441 C          CAF     V06N34SR    DISPLAY TIME OF INTERCEPT
0102   REF    2  LAST  515   04,3176  0 3424 C          TC      VNDSPLY
0103   REF   64  LAST  516   04,3177  0 6006 1          TC      INTPRET
0104                         04,3200   45014 C  JUNCTN1  CLEAR   CALL
0105   REF    1              04,3201   04266 1                  P39/79SW
0106   REF    3  LAST  458   04,3202   10716 C                  SELECTMU    SELECT MU, CLEAR FINALFLG, GO TO VN1645
0107                         04,3203   77624 1  RECYCLE CALL
0108   REF    2  LAST  516   04,3204   11357 C                  PREC/TT
0109                         04,3205   71214 C          BOFF    DLOAD
0110   REF    3  LAST  516   04,3206   01350 C                  OPTNSW
0111   REF    1              04,3207   11227 C                  OPTN2
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L STABLE ORBIT - P38-P39 USER'S PAGE NO. 4 E4 S3

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 0112   REF   3  LAST  516   04,3210   03656 1                    TINT
 0113   REF  18  LAST  505   04,3211   34041 0          STCALL    TDEC1        PRECISION UPDATE PASSIVE VEHICLE TO
 0114   REF   1               04,3212   11410 1                    INTRPVP        INTERCEPT TIME
 0115                         04,3213   53575 0          VLOAD     UNIT
 0116   REF  14  LAST  505   04,3214   00001 0                    RATT         RP/(RP)
 0117                         04,3215   47315 0          PDVL      VXV
 0118   REF  11  LAST  505   04,3216   00007 0                    VATT
 0119                         04,3217   60246 1          ABVAL     NORM         (VP X RP/(RP))
 0120   REF   7  LAST  499   04,3220   00047 1                    X1
 0121                         04,3221   56325 0          PDDL      DDV
 0122   REF   5  LAST  273   04,3222   02611 0                    DELTAR
 0123                         04,3223   77657 0          SL*                    DELTA R / (VP X RP/RP)
 0124                         04,3224   20172 1                    0 -7,1
 0125   REF   1               04,3225   36613 0          STCALL    DELTTIME     DELTA T = (RP) DELTA R / (VP X RP)
 0126   REF   1               04,3226   11233 0                    JUNCTN2
 0127                         04,3227   43345 1  OPTN2   DLOAD    DAD
 0128   REF   2  LAST  516   04,3230   02611 0                    TINTSOI
 0129   REF   2  LAST  459   04,3231   00037 0                    T
 0130   REF   4  LAST  517   04,3232   03656 1          STORE     TINT         TI = TI + TF
 0131                         04,3233   45345 1  JUNCTN2 DLOAD    DSU
 0132   REF   5  LAST  517   04,3234   03656 1                    TINT
 0133   REF   2  LAST  517   04,3235   02613 1                    DELTTIME
 0134   REF   1               04,3236   02615 1          STORE     TARGTIME     TT = TI - DELTA T
R0135   .... MAINRTNE ....
R0136   SUBROUTINES USED

R0137           S3435.25
R0138           PERIAPO1
R0139           SHIFTR1
R0140           VNDSPLY
R0141           BANKCALL
R0142           GOFLASH
R0143           GOTOPOOH
R0145           VN1645

 0146   REF  19  LAST  517   04,3237   34041 0  MAINRTNE STCALL    TDEC1        PRECISION UPDATE PASSIVE VEHICLE TO
 0147   REF   2  LAST  517   04,3240   11410 1                    INTRPVP        TARGET TIME
 0148                         04,3241   77745 1          DLOAD
 0149   REF  24  LAST  516   04,3242   03413 1                    TIG
 0150   REF   7  LAST  480   04,3243   03503 1          STORE     INTIME
 0151                         04,3244   77331 0          SSP       VLOAD
 0152   REF  14  LAST  515   04,3245   02371 0                    SUBEXIT
 0153   REF   1               04,3246   11252 1                    TEST3979
 0154   REF  15  LAST  517   04,3247   00001 0                    RATT
 0155                         04,3250   77624 1          CALL
 0156   REF   1               04,3251   72547 1                    S3435.25
 0157                         04,3252   43014 0  TEST3979 BOFF    BON
 0158   REF   2  LAST  516   04,3253   04346 1                    P39/79SW
 0159   REF   1               04,3254   11263 0                    MAINRTN1
 0160   REF   5  LAST  484   04,3255   01311 0                    FINALFLG
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0161   REF   1                  04,3256   11261 1                 P39P79
0162                            04,3257   77614 1           SET
0163   REF   4   LAST  472      04,3260   00470 1                 UPDATFLG
0164                            04,3261   77776 1  P39P79   EXIT
01645  REF   1                  04,3262   0 3310 C         TC     DSPLY81      FOR P39 AND P79
0165                            04,3263   51575 1  MAINRTN1 VLOAD  ABVAL
0166   REF  12   LAST  481      04,3264   03646 C                 DELVEET3
0167   REF   5   LAST  455      04,3265   26635 C          STOVL  DELVTPI      DELTA V
0168   REF   4   LAST  465      04,3266   03640 C                 VPASS4
0169                            04,3267   51451 C          VSU    ABVAL
0170   REF   7   LAST  481      04,3270   03620 C                 VTPRIME
0171   REF   5   LAST  455      04,3271   26637 1          STOVL  DELVTPF      DELTA V (FINAL) = V'T - VT
0172   REF  16   LAST  488      04,3272   03540 C                 RACT3
0173                            04,3273   45115 C          PDVL   CALL
0174   REF   9   LAST  481      04,3274   03612 1                 VIPRIME
0175   REF   2   LAST  455      04,3275   45312 C                 PERIAPO1     GET PERIGEE ALTITUDE
0176                            04,3276   77624 1          CALL
0177   REF   2   LAST  455      04,3277   45422 1                 SHIFTR1
0178   REF   3   LAST  455      04,3300   02641 C          STORE  POSTTPI
0179                            04,3301   43014 C          BON    SET
0180   REF   6   LAST  517      04,3302   01311 C                 FINALFLG
0181   REF   1                  04,3303   11305 1                 DSPLY58
0182   REF   5   LAST  518      04,3304   00470 1                 UPDATFLG
0183                            04,3305   77776 1  DSPLY58  EXIT
0184   REF   1                  04,3306   3 3442 C         CAF    V06N58SR     DISPLAY HP, DELTA V, DELTA V (FINAL)
0185   REF   3   LAST  516      04,3307   0 3424 C         TC     VNDSPLY
0186   REF   1                  04,3310   3 3443 1  DSPLY81 CAF    V06N81SR     DISPLAY DELTA V (LV)
0187   REF   4   LAST  518      04,3311   0 3424 C         TC     VNDSPLY
0188   REF  65   LAST  516      04,3312   0 6006 1         TC     INTPRET
0189                            04,3313    77214 C        CLEAR  VLOAD
0204   REF   2   LAST  470      04,3314    01267 C                XDELVFLG
0205   REF  13   LAST  518      04,3315    03646 C                DELVEET3
0206   REF   5   LAST  471      04,3316    37646 1        STCALL  DELVSIN
0207   REF   4   LAST  484      04,3317    73005 C                VN1645       DISPLAY TRKMKCNT, TTOGO, *MGA
0208                            04,3320    52014 C        BON     GOTO
0209   REF   3   LAST  517      04,3321    04306 C                P39/79SW
0210   REF   1                  04,3322    11344 1                P39/P79B
0211   REF   1                  04,3323    11203 C                RECYCLE
R0212  STABLE ORBIT MIDCOURSE PROGRAM (P39 AND P79)

R0213  MOD NO -1          LOG SECTION - STABLE ORBIT - P38-P39
R0214  MOD BY RUDNICKI.S  DATE 25JAN68

R0215  FUNCTIONAL DESCRIPTION

R0216          P39 AND P79 CALCULATE THE REQUIRED DELTA V AND OTHER INITIAL
R0217          CONDITIONS REQUIRED BY THE AGC TO MAKE A MIDCOURSE CORRECTION
R0218          MANEUVER AFTER COMPLETING THE SCI MANEUVER BUT BEFORE MAKING
R0219          THE SOR MANEUVER
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L STABLE ORBIT - P38-P39 USER'S PAGE NO. 6 E4 S3

R0220 CALLING SEQUENCE

R0221 ASTRONAUT REQUEST THRU DSKY

R0222 V37E39E IF THIS VEHICLE IS ACTIVE VEHICLE
R0223 V37E79E IF OTHER VEHICLE IS ACTIVE VEHICLE

R0224 INPUT

R0225 (1) TPASS4 TIME OF INTERCEPT - SAVED FROM P38/P78
R0226 (2) TARGTIME TIME THAT PASSIVE VEHICLE IS AT INTERCEPT POINT -
R0227 SAVED FROM P38/P78

R0228 OUTPUT

R0229 (1) TRKMKCNT NUMBER OF MARKS
R0230 (2) TTOGO TIME TO GO
R0231 (3) +MGA MIDDLE GIMBAL ANGLE
R0232 (4) DELVLVC DELTA VELOCITY AT MIC - LOCAL VERTICAL COORDINATES

R0233 SUBROUTINES USED

R0234 AVFLAGA
R0235 AVFLAGP
R0236 LOADTIME
R0237 SELECTMU
R0238 PRECSET
R0239 S34/35.1
R0240 MAINFTNE

0241	REF	111	LAST	516	04,3324	0 4555	C	P39	TC	BANKCALL	
0242	REF	4	LAST	515	04,3325	73726	C		CADR	AVFLAGA	THIS VEHICLE ACTIVE
0243					04,3326	0 0006	1		EXTEND		
0244	REF	2	LAST	458	04,3327	3 1422	1		DCA	ATIGINC	
0245	REF	1			04,3330	0 3335	1		TC	P39/P79A	
0246	REF	112	LAST	519	04,3331	0 4555	C	P79	TC	BANKCALL	
0247	REF	4	LAST	515	04,3332	73741	1		CADR	AVFLAGP	OTHER VEHICLE ACTIVE
0248					04,3333	0 0006	1		EXTEND		
0249	REF	2	LAST	458	04,3334	3 1424	1		DCA	PTIGINC	
0250	REF	9	LAST	458	04,3335	53*764	1	P39/P79A	DXCH	KT	TIME TO PREPARE FOR BURN
02505	REF	113	LAST	519	04,3336	0 4555	C		TC	BANKCALL	
02506	REF	4	LAST	515	04,3337	73746	C		CADR	P20FLGON	SET UPDATFLG, TRACKFLG
0251	REF	66	LAST	518	04,3340	0 6006	1		TC	INTPRET	
0255					04,3341	45014	C		SET	CALL	
02555	REF	4	LAST	518	04,3342	04066	C			P39/79SW	
0256	REF	4	LAST	516	04,3343	10716	0			SELECTMU	SELECT MU, CLEAR FINALFLG, GO TO VN1645
0257					04,3344	43234	C	P39/P79B	RTB	DAD	
0258	REF	9	LAST	506	04,3345	45505	C			LOADTIME	
0259	REF	10	LAST	519	04,3346	02364	1			KT	
02595	REF	25	LAST	517	04,3347	03413	1		STORE	TIG	TIG = T (PRESENT) + PREPARATION TIME

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0260   REF  20  LAST  517   04,3350   34041 0          STCALL TDEC1          PRECISION UPDATE ACTIVE AND PASSIVE
0261   REF   3  LAST  458   04,3351   45354 1                 PRECSET           VEHICLES TO TIG
0262                        04,3352   77624 1          CALL
0263   REF   3  LAST  459   04,3353   72522 1                 S34/35.1          GET UNIT NORMAL
0264                        04,3354   52145 0          DLOAD  GOTO
0265   REF   2  LAST  517   04,3355   02615 1                 TARGTIME
0266   REF   1               04,3356   11237 1                 MAINRTNE          CALCULATE DELTA V AND DELTA V (LV)
R0272  .... PREC/TT ....
R0273  SUBROUTINES USED

R0274          PRECSET
R0275          TIMETHET
R0276          S34/35.1

0277                        04,3357   71220 1  PREC/TT  STQ    DLOAD
0278   REF   6  LAST  474   04,3360   02367 1                 RTRN
0279   REF  26  LAST  519   04,3361   03413 1                 TIG
0280   REF  21  LAST  520   04,3362   34041 0          STCALL TDEC1          PRECISION UPDATE ACTIVE AND PASSIVE
0281   REF   4  LAST  520   04,3363   45354 1                 PRECSET           VEHICLES TO TIG
0282                        04,3364   53775 1          VLOAD  VSR*
0283   REF   8  LAST  488   04,3365   03554 0                 RPASS3
0284                        04,3366   57176 0                 0,2
0285   REF   3  LAST  486   04,3367   16657 1          STODL  RVEC
0286   REF   5  LAST  454   04,3370   03754 1                 CENTANG
0287                        04,3371   71406 0          PUSH   COS
0288   REF   3  LAST  454   04,3372   16734 0          STODL  CSTH
0289                        04,3373   43156 1          SIN    SET
0290   REF   2  LAST  454   04,3374   03466 0                 RVSW
0291   REF   3  LAST  454   04,3375   26732 0          STOVL  SRTH
0292   REF   8  LAST  488   04,3376   03562 0                 VPASS3
0293                        04,3377   77657 0          VSR*
0294                        04,3400   57176 0                 0,2
0295   REF   5  LAST  486   04,3401   36746 1          STCALL VVEC           GET TRANSFER TIME BASED ON CENTANG OF
0296   REF   2  LAST  454   04,3402   24737 1                 TIMETHET            PASSIVE VEHICLE
0297                        04,3403   77624 1          CALL
0298   REF   4  LAST  520   04,3404   72522 1                 S34/35.1          GET UNIT NORMAL
0299                        04,3405   52145 0          DLOAD  GOTO
0300   REF   3  LAST  517   04,3406   00037 0                 T
0301   REF   7  LAST  520   04,3407   02367 1                 RTRN
R0302  .... INTRPVP ....
R0303  SUBROUTINES USED

R0304          CSMPREC
R0305          LEMPREC

0306                        04,3410   43020 1  INTRPVP  STQ    BOFF             PRECISION UPDATE PASSIVE VEHICLE TO
0307   REF   8  LAST  520   04,3411   02367 1                 RTRN               TDEC1
0308   REF   4  LAST  488   04,3412   01352 1                 AVFLAG
0309   REF   1               04,3413   11420 1                 OTHERV
0310                        04,3414   77624 1          CALL
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 0311   REF   3  LAST  48E   04,3415   27022 1                    CSMPREC
 0312                       04,3416   77650 1           GOTO
 0313   REF   9  LAST  52C   04,3417   02367 1                    RTRN
 0314                       04,3420   77624 1  OTHERV   CALL
 0315   REF   3  LAST  488   04,3421   27036 1                    LEMPREC
 0316                       04,3422   77650 1           GOTO
 0317   REF  10  LAST  521   04,3423   02367 1                    RTRN
R0318   .... VNDSPLY ....
R0319   SUBROUTINES USED

R0320           BANKCALL
R0321           GOFLASH
R0322           GOTOPOOH

 0323                       04,3424   0 0006 1  VNDSPLY  EXTEND                 FLASH DISPLAY
 0324   REF  11  LAST  521   04,3425   23767 0           QXCH     RTRN
 0325   REF   4  LAST  474   04,3426   55765 0           TS       VERBNOUN
 0326   REF   5  LAST  521   04,3427   3 1765 1          CA       VERBNOUN
 0327   REF 114  LAST  519   04,3430   0 4555 0          TCR      BANKCALL
 0328   REF  16  LAST  50C   04,3431    20624 0          CADR     GOFLASH
 0329   REF  16  LAST  516   04,3432   1 4106 0          TCF      GOTOPOOH      TERMINATE
 0330   REF  12  LAST  521   04,3433   0 1767 0          TC       RTRN          PROCEED
 0331                       04,3434   1 3427 1          TCF      -5            RECYCLE
 0351                       04,3435    01441 1 V06N33SR VN       0633
 0352                       04,3436    01467 0 V06N55SR VN       0655
 0353                       04,3437    01006 0 V04N06SR VN       0406
 0354                       04,3440    01471 1 V06N57SR VN       0657
 0355                       04,3441    01442 1 V06N34SR VN       0634
 0356                       04,3442    01472 1 V06N58SR VN       0658
 0357                       04,3443    01521 0 V06N81SR VN       0681
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*** END OF SMOOCH .005 ***

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P0001   EARTH ORBIT INSERTION MONITOR PROGRAM
R0002   ************************************

R0003   PROGRAM DESCRIPTION -P11-

R0004       MCC NO. 1
R0005       MCC BY ELIASSEN

R0006   FUNCTIONAL DESCRIPTION

R0007       P11 IS INITIATED BY

R0008            A) GYROCOMPASS PRG P02 WHEN LIFTOFF DISCRETE IS RECEIVED OR
R0009            B) BACKUP THRU VERB 75 ENTER

R0010       PROGRAM WILL
R0011           1. ZERO CMC CLOCK AT LIFTOFF (OR UPON RECEIPT OF BACKUP)
R0012           2. UPDATE TEPHEM TO TIME CMC CLOCK WAS ZEROED
R0013           3. INITIATE SERVICER AT PREREAD1
R0014           4. CHANGE MAJOR MODE TO 11
R0015           5. CLEAR DSKY IN CASE OF V 75
R0016           6. STORE LIFTOFF IMU-CDU ANGLES FOR ATT. ERROR DISPLAY
R0017           7. TERMINATE GYROCOMPASSING - -
R0018           8. COMPUTE INITIAL VECTORS  RN, VN                - - -
R0019           9. COMPUTE REFSMMAT FOR PRELAUNCH ALIGNMENT WHERE U ,U ,U  ARE
R0020              -     -                                        X  Y  Z
R0021              U =UNIT(-R) LOCAL VERTICAL AT TIME OF LIFTOFF
R0022               Z
R0023              -       -   -
R0024              U =UNIT (A), A=HOR VECTOR AT LAUNCH AZIMUTH
R0025               X
R0026              -  -   -
R0027              U =U * U
R0028               U  Z  X

R0029          10. SET REFSMMAT KNOWN FLAG
R0030          11. SET AVGEXIT IN SERVICER TO VHHDOT TO
R0031              COMPUTE AND DISPLAY NOUN 62 EVERY 2 SECONDS

R0032              R1  V1  - INTERTIAL VELOCITY MAGNITUDE IN FPS
R0033              R2  HDOT - RATE OF CHANGE OF VEHICLE VEL IN FPS
R0034              R3  H    - VEHICLE ALTITUDE ABOVE PAD IN NM

R0035          12. DISPLAY BODY AXES ATT. ERRORS ON FDAI NEEDLES

R0036              A) FROM L.O. TO RPSTART (APPROX. 0 TO +10SECS AFTER L.O.)
R0037                 DESIRED ATTITUDE IS AS STORED AT L.O.
R0038              B) FROM RPSTART TO POLYSTOP(APPROX.+10 TO +133SECS AFTER LO)
R0039                 DESIRED ATTITUDE IS SPECIFIED BY CMC PITCH AND ROLL
R0040                 POLYNOMIALS  DURING SATURN ROLLOUT AND PITCHOVER
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R0041                THE DISPLAY IS RUN AS LOW PRICRITY JOB APPROX.
R0042                EVERY 1/2 SEC OR LESS AND IS DISABLED UPON OVFLO OF TIME1

R0057   SUBROUTINES CALLED

R0058           2PHSCHNG  BANKCALL  CALCGRA   CDUTRIG   CLEANDSP  DANZIG
R00581          DELAYJOB  EARTHR    ENDOFJOB  FINDVAC   IBNKCALL
R00582          INTPRET   LALOTORV  NEEDLER   NEWMODEX  PHASCHNG
R0059           POSTJUMP  POWRSERS  PREREAD1  REGODSPR  S11.1
R00591          SERVEXIT  TASKOVER  TOCDANZIG  VISTO2S   WAITLIST

R0060   ASTRONAUT REQUESTS (IF ALTITUDE ABOVE 300,000 FT)

R0061       DSKY -
R0062            MONITOR DISPLAY OF TIME TO PERIGEE R1 HOURS
R0063                                              R2 MINUTES

R0064       DSKY -
R0065            MONITOR DISPLAY OF R1 APOGEE ALTITUDE IN NAUTICAL MILES
R0066                              R2 PERIGEE ALTITUDE IN NAUTICAL MILES
R0067                              R3 TFF IN MINUTES/SECS

R0068       IF ASTRONAUT HAS REQUESTED ANY OF THESE DISPLAYS HE MUST
R0069       HIT KEY RELEASE BUTTON TO RETURN TO NORMAL NOUN 62 DISPLAY

R0070   NORMAL EXIT MODE

R0071       ASTRONAUT  VERB 37 ENTER 00 ENTER

R0072   ALARM MODES - NONE

R00721  ABORT EXIT MODES -

R00722      EARLY BOOST ABORT FOLLOWED BY REENTRY   V 37 E 62 E
R00723      LATE  BOOST ABORT FOLLOWED BY REENTRY   V 37 E 61 E

R0073   OUTPUT

R0074       LIFTOFF (DP)  TEPHEM (TP)
R0075       REFSMMAT
R0076       DSKY DISPLAY
R0077       FDAI DISPLAY

R0078   ERASABLE INITIALIZATION

R0079       A2C, AXO, -AYC
R0080       LATITUDE
R0081       PADLONG
R0082       TEPHEM
R0083       PONGSALT
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R0084       FCLYNUM THRU FCLYNUM +14D)
R00841      RFSTART
R00842      FCLYSTOP
R0085   FLAGS SET OR RESET

R0086       SET REFSMFLG
R0087       SET CVMON IDLE FLAG
R0088       CLEAR ERADFLAG

R0089   DEBRIS

R0090       LIFTTEMP
R0091       FCLYNUM THRU FCLYNUM +7
R0092       SFCLYARG
R0093       BODY1, BODY2, BODY3
R0094       VMAG2, ALTI, HDOT
R0095       CENTRALS, CORE SET AND VAC AREAS
 0096   REF   1                                        COUNT  34/P11

 0097   REF   1                4730        BITS5-6  =      SUPER011
 0098                       42,3521                 BANK   42
 0099   REF   1            34,2000                 SETLOC P11ONE
 0100                      34,2002                 BANK

 0101   REF   6  LAST  212  E3,1706                 EBANK=  TEPHEM
 0102   REF   2  LAST  183  34,2002  3 4744 1  P11  CA      EBANK3
 0103   REF  20  LAST  504  34,2003  54 003 0       TS      EBANK

 0104                      34,2004  0 0006 1       EXTEND
 0105   REF   1            34,2005  3 2273 0       DCA     REP11S          DIRECT RESTARTS TO REP11
 0106   REF   2  LAST  18C  34,2006  52 757 0       DXCH    -PHASE3
 01061  REF 1C9  LAST  507  34,2007  4 4714 0       CS      ZERO
 01062                     34,2010  22 007 0       ZL
 0107   REF   2  LAST   77  34,2011  55'265 0       TS      LIFTTEMP
 0108   REF   2  LAST  18C  34,2012  52 763 1       DXCH    -PHASE5         INACTIVE GROUP 5, PRELAUNCH PROTECTION
 0111                      34,2013  0 0006 1  P11+7  EXTEND
 0112   REF   1            34,2014  3 2275 0       DCA     REP11SA
 0113   REF   1            34,2015  53'337 0       DXCH    TLIFTOFF

 0114                      34,2016  0 0006 1       EXTEND
 0115   REF  13  LAST  406  34,2017  3 0025 0       DCA     TIME2
 0116   REF   3  LAST  524  34,2020  53'266 0       DXCH    LIFTTEMP        FOR RESTARTS

 0117   REF 11C  LAST  524  34,2021  3 4714 1       CA      ZERO
 0118                      34,2022  22 007 0       ZL
 0119   REF  14  LAST  524  34,2023  52 025 1       DXCH    TIME2
 0120   REF   2  LAST  524  34,2024  53'337 0  REP11A-2 DXCH  TLIFTOFF
 0121   REF   3  LAST  524  34,2025  52 757 0  REP11A-1 DXCH  -PHASE3        RESET PHASE
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0122                          34,2026  0 0004 C  REP11A   INHINT
0123                          34,2027  0 0006 1           EXTEND
0124  REF   7  LAST  524     34,2030  3 1710 C           DCA     TEPHEM  +1
0125  REF   2  LAST   77     34,2031  53'271 C           DXCH    TEPHEM1 +1
0126  REF   8  LAST  525     34,2032  3 1706 1           CA      TEPHEM
0127  REF   3  LAST  525     34,2033  57'267 C           XCH     TEPHEM1

0128                          34,2034  0 0006 1           EXTEND
0129  REF   3  LAST  524     34,2035  3 1337 1           DCA     TLIFTOFF
0130  REF   4  LAST  525     34,2036  21'271 C           DAS     TEPHEM1 +1
0131  REF   5  LAST  525     34,2037  27'267 1           ADS     TEPHEM1         CORRECTOFOR OVERFLOW

0132  REF  23  LAST  501     34,2040  0 5301 C           TC      PHASCHNG
0133                          34,2041   05023 C          OCT     05023
0134                          34,2042   22000 1          OCT     22000

0135                          34,2043  0 0004 C           INHINT
0136                          34,2044  0 0006 1           EXTEND
0137  REF   6  LAST  525     34,2045  3 1270 C           DCA     TEPHEM1
0138  REF   9  LAST  525     34,2046  53'707 1           DXCH    TEPHEM
0139  REF   7  LAST  525     34,2047  3 1271 1           CA      TEPHEM1 +2
0140  REF  10  LAST  525     34,2050  57'710 C           XCH     TEPHEM  +2

0141  REF   1                 34,2051  3 2000 C           CAF     EBDVCNT
0142  REF  21  LAST  524     34,2052  54 003 C           TS      EBANK
01421 REF  10  LAST  211     E7,1431                     EBANK=  DVCNTR
0143  REF  20  LAST  247     34,2053  0 4633 C           TC      IBNKCALL
0144  REF   1                 34,2054   76631 1          CADR    PREREAD1        ZERO PIPS AND INITIALIZE AVERAGEG

0145  REF  24  LAST  525     34,2055  0 5301 C           TC      PHASCHNG
0146                          34,2056   05023 C          OCT     05023           CONTINUE HERE ON RESTART
0147                          34,2057   22000 1          OCT     22000

0148  REF   3  LAST  438     34,2060  3 4731 C           CAF     .5SEC           START ATT ERROR DISPLAY
0150  REF  19  LAST  507     34,2061  0 5140 1           TC      WAITLIST        IN .5 SEC
0151  REF   3  LAST  209     E6,1704                     EBANK=  BODY3
0152  REF   2  LAST  209     34,2062   02314 C          2CADR   ATERTASK
0152                          34,2063   70066 C

0153  REF   6  LAST  442     34,2064  0 5243 1           TC      NEWMODEX        DISPLAY MM 11
0154                          34,2065   00013 C          MM      11

0155  REF 115  LAST  521     34,2066  0 4555 C           TC      BANKCALL
0156  REF   3  LAST  445     34,2067   20607 1          CADR    CLEANDSP        CLEAR DSKY IN CASE OF V75

0157  REF   3  LAST  425     34,2070  0 5261 1           TC      2PHSCHNG
0158                          34,2071   40514 C          OCT     40514           PROTECT ATERTASK
0159                          34,2072   00073 C          OCT     00073
0160  REF   1                 34,2073  3 2001 1           CAF     EBOPLACE
0161  REF  22  LAST  525     34,2074  54 003 C           TS      EBANK
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01611  REF   5  LAST  421   E5,1426                    EBANK= QPLACES
016111 REF   1             34,2075   3 2276 0        CA     P11XIT      SET EXIT FROM PROUT IN EARTHR
016112 REF   6  LAST  526   34,2076   55'426 1        TS     QPLACES
0162                       34,2077   22 007 0        ZL                 STORE DP GIMBAL
01621  REF  10  LAST  432   34,2100   3 0032 0        CA     CDUX        ANGLES FOR ATTITUDE
016211 REF  12  LAST  442   34,2101   53'760 0        DXCH   OGC         ERROR DISPLAY
016212                     34,2102   22 007 0        ZL                 AFTER L.O.
016213 REF   3  LAST  409   34,2103   3 0033 1        CA     CDUY
016214 REF   2  LAST   92   34,2104   53'762 1        DXCH   IGC
01622                      34,2105   22 007 0        ZL
016221 REF   7  LAST  409   34,2106   3 0034 0        CA     CDUZ
016222 REF   2  LAST   92   34,2107   53'764 1        DXCH   MGC
016223 REF  67  LAST  519   34,2110   0 6006 1        TC     INTPRET             -
016224                     34,2111    74575 0        VLOAD  VSR1        SCALE OGC B-1
016225 REF  13  LAST  526   34,2112    02760 1               OGC
016226 REF  14  LAST  526   34,2113    02760 1        STORE  OGC
0163                       34,2114    64375 1        VLOAD  MXV
0164   REF   2  LAST   96   34,2115    02467 0               THETAN
0165   REF  30  LAST  441   34,2116    02672 0               XSM
0166                       34,2117    53372 1        VSL1   VAD
0167   REF   3  LAST  438   34,2120    02650 0               ERCOMP
0168   REF   4  LAST  526   34,2121    16650 0        STODL  ERCOMP
0169   REF   4  LAST  525   34,2122    01337 1               TLIFTOFF
0170                       34,2123    52131 0        SSP    GOTO
0171   REF   6  LAST  512   34,2124    00052 0               S2
0172   REF   1             34,2125    66424 0        CADR   PROUT       RETURN FROM EARTHR
0173   REF   2  LAST  421   34,2126    66373 0               EARTHR +3
0174   REF  68  LAST  526   34,2127    0 6006 1  MATRXJOB TC     INTPRET
01741                      34,2130    77731 1        SSP                ZERO RTX2
01742  REF  10  LAST  490   34,2131    03747 0               RTX2        FOR
01743                      34,2132    00000 1               0           EARTH
0175                       34,2133    65345 0        DLOAD  PDDL
0176   REF   1             34,2134    01273 0               PGNCSALT    ALTITUDE OF PGNCS
0177   REF   2  LAST   77   34,2135    01264 0               PADLONG     LONGITUDE
0178                       34,2136    55525 0        PDDL   VDEF
0179   REF   6  LAST  443   34,2137    02403 1               LATITUDE    GEODETIC LATITUDE
0180   REF   6  LAST  274   34,2140    15104 0        STODL  LAT         LAT,LONG,ALT ARE CONSECUTIVE
0181   REF   2  LAST  512   34,2141    15332 1               HI6ZEROS    TIME = 0
0182                       34,2142    45014 0        CLEAR  CALL
0183   REF   2  LAST  449   34,2143    00662 0               ERADFLAG
0184   REF   1             34,2144    26373 1               LALOTORV    CONVERT TO POSITION VECTOR IN REF.COORDS

0185   REF   4  LAST   76   34,2145    35232 1        STCALL RN1                 -
01851  REF   1             34,2146    77260 0               CALCGRAV    RETURN WITH GRAVITY
01852                      34,2147    77656 1        UNIT               IN MPAC
01853  REF   5  LAST  495   34,2150    25752 0        STOVL  REFSMMAT +12D  UNIT2 = UNIT(GRAV)
01854  REF   5  LAST  526   34,2151    01232 0               RN1
0186                       34,2152    74235 0        VXV    VXSC
0187   REF   5  LAST  287   34,2153    01714 1               UNIT*       SCALED AT 1
0188   REF   1             34,2154    30300 1               -EPTHRAT    V = EARTHRATE X R
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0189                              34,2155   77712 C   VSL4                SCALE TO 2(7) M/CS
0190  REF   2  LAST   76          34,2156   25240 C   STOVL   VN1
0191  REF   6  LAST  526          34,2157   01752 C           REFSMMAT +12D
0209                              34,2160   53435 C   VXV     UNIT
0210  REF   6  LAST  526          34,2161   01714 1           UNITW             (REF3 X UNITW) = EAST
0211                              34,2162   47206 C   PUSH    VXV
0212  REF   7  LAST  527          34,2163   01752 C           REFSMMAT +12D     (EAST X REF3) = -SOUTH
0213                              34,2164   65256 C   UNIT    PDDL
0214  REF   5  LAST  445          34,2165   02634 1           LAUNCHAZ          COS(AZ)*SOUTH
0215                              34,2166   74346 C   COS     VXSC
0216                              34,2167   77626 C   STADR
0217  REF   8  LAST  527          34,2170   62041 0   STODL   REFSMMAT          TEMPORARY STORAGE
0218  REF   6  LAST  527          34,2171   02634 1           LAUNCHAZ
0219                              34,2172   74356 1   SIN     VXSC              SIN(AZ)*EAST
0220                              34,2173   53455 C   VAD     UNIT              SIN(AZ)*EAST - COS(AZ)*SOUTH = REF1
0221  REF   9  LAST  527          34,2174   01736 1           REFSMMAT
0222  REF  10  LAST  527          34,2175   01736 1   STORE   REFSMMAT

0223                              34,2176   53435 0   VXV     UNIT              (REF1 X REF3) = -REF3
0224  REF  11  LAST  527          34,2177   01752 C           REFSMMAT +12D
0225                              34,2200   77676 0   VCOMP
0226  REF  12  LAST  527          34,2201   01744 1   STORE   REFSMMAT +6
02261                             34,2202   45345 1   DLOAD   DSU
02262 REF  11  LAST  461          34,2203   15330 C           DPHALF            1/2 REV
02263 REF   7  LAST  527          34,2204   02634 1           LAUNCHAZ
02264                             34,2205   65215 1   DAD     PDDL
02265 REF   5  LAST  443          34,2206   02401 C           AZIMUTH
02266 REF   2  LAST  112          34,2207   03301 C           SATRLRT           SET  SATRLRT = -SATRLRT IF
02267                             34,2210   45565 C   SIGN    STADR             (1/2REV -LAUNCHAZ +AZIMUTH) IS NEGATIVE
02268 REF   3  LAST  527          34,2211   74476 1   STORE   SATRLRT           FOR ROLL CALC IN FDAI ATT. ERROR DISPLAY
0227                              34,2212   77414 C   SET     EXIT
0228  REF   2  LAST  471          34,2213   01462 0           REFSMFLG          SET REFSMMAT KNOWN FLAG

0229  REF  25  LAST  525          34,2214  0 5301 C   TC      PHASCHNG
0230                              34,2215   04023 1   OCT     04023

0231                              34,2216  0 0006 1   EXTEND
0232  REF   1                     34,2217  3 2302 1   DCA     P11SCADR
0233  REF   1                     34,2220  53'223 1   DXCH    AVGEXIT           SET AVGEXIT

0234  REF   2  LAST  299          34,2221  3 7665 0   CA      PRIO31            2 SECONDS AT 2(+8)
0235  REF   9  LAST  434          34,2222  55'074 1   TS      1/PIPADT

0236  REF   5  LAST  409          E6,1501            EBANK=  RCSFLAGS
0237  REF   8  LAST  252          34,2223  3 4752 C  CA      EBANK6
0238  REF  23  LAST  525          34,2224  54 003 C  TS      EBANK

0239                              34,2225  0 0004 C  INHINT
0246  REF 111  LAST  524          34,2226  4 4714 C  CS      ZERO
0247  REF   1                     34,2227  55'063 1  TS      TBASE5            RESTART READACCS 2 SECONDS AFTER LIFTOFF
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0248   REF  10  LAST  428   34,2230  4 0025 1          CS      TIME1
0249   REF   1              34,2231  6 4735 1          AD      2SECS       DO READACCS 2 SECONDS AFTER LIFTOFF

0250   REF 140  LAST  507   34,2232  10 000 0          CCS     A           CHECK TO INSURE DT IS POSITIVE
0251                        34,2233  1 2236 0          TCF     +3          TIME POSITIVE
0252                        34,2234  1 2236 0          TCF     +2          CANNOT GET HERE
0253   REF 112  LAST  527   34,2235  3 4714 1          CA      ZERO        TIME NEGATIVE - SET TO 1
0254   REF  65  LAST  516   34,2236  6 4712 1          AD      ONE         RESTORE TIME  -  OR MAKE POSITIVE

0255   REF  20  LAST  525   34,2237  0 5140 1          TC      WAITLIST
0256   REF  14  LAST  211   E6,1661                    EBANK=  AOG
0257   REF   1              34,2240   02653 0          2CADR   READACCS
0257   REF   1              34,2241   76066 0
0258   REF   4  LAST  525   34,2242  0 5261 1          TC      2PHSCHNG
0259                        34,2243   00003 1          OCT     00003       TURN OFF GROUP 3
0260                        34,2244   00025 0          OCT     00025       PROTECT NORMLIZE AND READACCS

0261   REF  36  LAST  445   34,2245  0 4574 0          TC      POSTJUMP
0262   REF   2  LAST  210   34,2246   77145 1          CADR    NORMLIZE    DO NORMLIZE AND ENDOFJOB


0263   REF  11  LAST  525   E3,1706                    EBANK=  TEPHEM
0264                        34,2247  0 0004 0  REP11    INHINT
0265   REF   1              34,2250  10 763 1          CCS     PHASE5
0266   REF  63  LAST  516   34,2251  0 5112 0          TC      ENDOFJOB

0267   REF   4  LAST  524   34,2252  11'265 0          CCS     LIFTTEMP
0268                        34,2253  1 2257 1          TCF     +4
0269                        34,2254  1 2257 1          TCF     +3
0270                        34,2255  1 2257 1          TCF     +2
0271   REF   1              34,2256  1 2013 0          TCF     P11+7

0272   REF   5  LAST  526   34,2257  4 1336 1          CS      TLIFTOFF
0273                        34,2260  0 0006 1          EXTEND
0274   REF   1              34,2261  6 2267 0          BZMF    ENDREP11

0275   REF  15  LAST  524   34,2262  10 024 0          CCS     TIME2       **TIME2 MUST BE NON-ZERO AT LIFTOFF**
0276   REF   2  LAST  206   34,2263  1 2021 1          TCF     REP11A -5   T2,T1 NOT YET ZEROED, GO AND DO IT

0277                        34,2264  0 0006 1          EXTEND              T2,T1 ZEROED, SET TLIFTOFF
0279   REF   5  LAST  528   34,2265  3 1266 1          DCA     LIFTTEMP
0280   REF   1              34,2266  1 2024 1          TCF     REP11A-2

0281                        34,2267  0 0006 1  ENDREP11 EXTEND
0282   REF   2  LAST  524   34,2270  3 2275 0          DCA     REP11SA
0283   REF   1              34,2271  1 2025 0          TCF     REP11A-1


0284                        34,2272   77766 0  REP11S   2OCT    77766 00011
0284                        34,2273   00011 1
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 0285                          34,2274   77764 1  REP11SA  2OCT   77764 00013
 0285                          34,2275   00013 0

02851  REF   1                34,2276   02451 0  P11XIT   GENADR P11OUT
 0286                          34,2277   71704 1  -ERTHRAT 2DEC*  -7.292115138 E-7 B18*   - EARTH RATE AT 2(18)
 0286                          34,2300   41735 0
 0288  REF   4  LAST  525      E6,1704                    EBANK= BODY3
 0289  REF   1                34,2301   02303 0  P11SCADR 2CADR  VHHDOT
 0289  REF   1                34,2302   70066 0
 0290  REF   5  LAST  529      E6,1704                    EBANK= BODY3
R0295  VHHDOT IS EXECUTED EVERY 2 SECONDS TO DISPLAY ON DSKY
R0296                         VI INERTIAL VELOCITY MAGNITUDE
R0297                         HDOT  RATE OF CHANGE OF ALT ABOVE L PAD RADIUS
R0298                         H   ALTITUDE ABOVE L PAD RADIUS

 0299  REF  69  LAST  526      34,2303  0 6006 1  VHHDOT   TC     INTPRET
 0300                          34,2304   77624 1            CALL                 LOAD VMAGI, ALTI,
 0301  REF   1                34,2305   70436 1                 S11.1           HDOT FOR DISPLAY
 0302                          34,2306   77776 1            EXIT
 0303  REF   1                34,2307  3 2511 0            CAF    V06N62        DISPLAY IN R1   R2    R3
 0304  REF 116  LAST  529      34,2310  0 4555 0            TC     BANKCALL                 VI   HDOT  H
 0305  REF   1                34,2311   20621 0            CADR   REGODSPR      DISPLAY INTERFACE - IMMEDIATE RETURN
 0306  REF 117  LAST  529      34,2312  0 4555 0            TC     BANKCALL
 0307  REF   1                34,2313   77136 0            CADR   SERVEXIT      END OF P11SERVE CYCLE
 0308  REF   1                34,2314  3 4701 0  ATERTASK CAF    PRIO1         ESTABLISH JOB TO DISPLAY ATT ERRORS
 0309  REF  20  LAST  508      34,2315  0 5042 1            TC     FINDVAC       COMES HERE AT L.O. + .33 SEC
 0310  REF   6  LAST  529      E6,1704                    EBANK= BODY3
 0311  REF   1                34,2316   02326 1            2CADR  ATERJOB
 0311  REF   1                34,2317   70066 0
03111  REF   6  LAST  527      34,2320  4 1501 0            CS     RCSFLAGS      SET BIT3 FOR
03112  REF  17  LAST  516      34,2321  7 4710 1            MASK   BIT3          NEEDLER
03113  REF   7  LAST  529      34,2322  27501 0            ADS    RCSFLAGS      INITIALIZATION PASS
03114  REF  21  LAST  525      34,2323  0 4633 0            TC     IBNKCALL      AND GO
03115  REF   1                34,2324   42404 1            CADR   NEEDLER       DO IT
 0312  REF  25  LAST  507      34,2325  0 5213 1            TC     TASKOVER
R0313  THIS SECTION PROVIDES ATTITUDE ERROR DISPLAYS TO THE FDAI DURING SOME BOOST

A0315                                  COMPUTE DESIRED PITCH W.R.T. LAUNCH SITE LOCAL VERTICAL.
A0316                                  PITCH = -.0000469184028+.001375715S6*T+.0231502280*T*T-.0205929365*T*T*T
A0317                                        SCALED TO 32 REVOLUTIONS
A0318                                  IF TL = TIME FROM LAUNCH IN SECONDS, THEN   T = 100(TL-10SEC)/(2**14)
A0319                                  WHERE   TL GE  10 SEC
A0320                                          TL LE 133 SEC .

A0321                                  COMPUTE DESIRED ROLL WHERE ROLL EQUALS COUNTER-CLOCKWISE ANGLE FROM
A0322                                  LAUNCHAZ TO -Z(S/C) AS SEEN FROM X(S/C).
A0323                                  ROLL = LAUNCHAZ-AZIMUTH-.5 +SATRLRT*T      IN REV
A0324                                  SATRLRT = RATE OF ROLL IN REV/CENTI-SEC
A0325                                  T,IN CENTI-SEC,IS DEFINED AS ABOVE,INCLUSIVE OF TIME RESTRICTIONS
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A0326                          FOR SIMPLICITY, LET    P = 2*PI*PITCH
A0327                                                 R = 2*PI*ROLL

A0328                          CONSTRUCT THE TRANSFORMATION MATRIX, TSMV, GIVING DESIRED S/C AXES IN
A0329                          TERMS OF SM COORDINATES. LET THE RESULTING ROWS EQUAL THE VECTORS XDC,
A0330                          YDC,AND ZDC.

A0331                           *     (    SIN(P)          0         -COS(P)     )   (XDC)
A0332                          TSMV = (-SIN(R)*COS(P)   -COS(R)   -SIN(R)*SIN(P)) = (YDC)
A0333                                 (-COS(R)*COS(P)    SIN(R)   -COS(R)*SIN(P))   (ZDC)

A0334                          XDC,YDC,ZDC ARE USED AS INPUT TO CALCGTA FOR THE EXTRACTION OF THE
A0335                          EULER SET OF ANGLES WHICH WILL BRING THE SM INTO THE DESIRED
A0336                          ORIENTATION. THIS EULER SET, OGC, IGC, AND MGC, MAY BE IDENTIFIED
A0337                          AS THE DESIRED CDU ANGLES.

A0338                          (XDC)                    (OGC)
A0339                          (YDC) ---) CALCGTA ---) (IGC)
A0340                          (ZDC)                    (MGC)

A0341                                                  -
A0342                          DEFINE THE VECTOR DELTACDU.

A0343                           -          (OGC)   (CDUX)
A0344                          DELTACDU = (IGC) - (CDUY)
A0345                                     (MGC)   (CDUZ)

A0346                                                  -          -    *    -
A0347                          COMPUTE ATTITUDE ERRORS, A, WHERE    A = TGSC*DELTACDU

A0348                           *     (1          SIN(CDUZ)              0     )   THE GIMBAL ANGLES
A0349                          TGSC = (0   COS(CDUX)*COS(CDUZ)   SIN(CDUX))) = TO SPACECRAFT AXES
A0350                                 (0  -SIN(CDUX)*COS(CDUZ)   COS(CDUX))   CONVERSION MATRIX

A0351                                                  -
A0352                          THE ATTITUDE ERRORS, A, ARE STORED ONE HALF SINGLE PRECISION IN
A0353                          THE REGISTERS AK, AK1, AK2 AS INPUT TO NEEDLER, THE FDAI ATTITUDE
A0354                          ERROR DISPLAY ROUTINE.

 0355   REF  16  LAST  528   34,2326  30 024 1  ATERJOB  CAE     TIME2          CHECK IF MORE THAN
 0356                        34,2327  0 0006 1            EXTEND                 164 SECONDS FROM L.O.
 0357                        34,2330  6 2332 1            BZMF    +2
 0358   REF   1              34,2331  1 2424 0            TCF     SATCLEAR       YES - CLEAR ERROR COUNTER + EXIT
 0359   REF   9  LAST  254   34,2332  30 102 1            CAE     FLAGWRD6       CHECK FLAGWRD6
 0360   REF   7  LAST  254   34,2333  7 4105 0            MASK    OCT60000       BITS 14 + 15
 0361                        34,2334  0 0006 1            EXTEND
 0362   REF   1              34,2335  1 2337 0            BZF     ATTDISP        NO SATURN STICK ON
 0363   REF   1              34,2336  0 2420 0            TC      ATERSET        EXIT - SATURN STICK IN USE
 0364   REF   2  LAST  112   34,2337  4 1702 1  ATTDISP   CS      RPSTART        PITCH/ROLL START TIME
 0365   REF  11  LAST  528   34,2340  6 0025 0            AD      TIME1
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03651                          34,2341  0 0006 1          EXTEND
03652  REF   1                 34,2342  6 2504 1          BZMF    NOPOLY          IF MINUS THEN ATTITUDE HOLD
0366   REF 240  LAST  512      34,2343  54 154 0          TS      MPAC            MPAC = TIME1 - RPSTART
0367   REF   2  LAST  112      34,2344  55'707 1          TS      SPOLYARG        SAVE FOR USE IN ROLL CALCULATION
0368   REF   2  LAST  112      34,2345  6 1703 1          AD      POLYSTOP        NEG PITCHOVER TIME IN CSECS
0369                           34,2346  0 0006 1          EXTEND
0370                           34,2347  6 2351 1          BZMF    +2
0371   REF   1                 34,2350  1 2416 1          TCF     SATOLT          EXIT IF TIME1 GR THAN (RPSTART-POLYSTOP)
0372   REF   3  LAST  111      34,2351  31'661 1          CAE     POLYNUM
0373   REF  60  LAST  507      34,2352  54 001 1          TS      L
0374   REF   1                 34,2353  3 2510 1          CAF     COEFPOLY        EVALUATE PITCH POLYNOMIAL
0375   REF   1                 34,2354  0 7164 0          TC      POWRSERS        SCALED TO 32 REVOLUTIONS

A0376                                   THE FOLLOWING PAD LOADED COEFFICIENTS ARE
A0377                                   USED TO COMPUTE THE PITCH POLYNOMIAL

A03771                                  ----- SUNDISK SI COEFS -----
A0378                                   POLYNUM         FIVE                    POLYNOMIAL DEGREE -1
A0379                                           +1      2DEC    -.469184028 E-4 A0
A0380                                           +3      2DEC    .137571556 E-2  A1
A0381                                           +5      2DEC    .231502280 E-1  A2
A0382                                           +7      2DEC    -.205929365 E-1 A3
A0383                                           +9D     2DEC    0               A4
A0384                                           +11D    2DEC    0               A5
A0385                                           +13D    2DEC    0               A6
A0386                                   POLYLOC         =       POLYNUM +10D

0387   REF 113  LAST  528      34,2355  3 4714 1          CA      ZERO            RETURN WITH PITCH(32REV)
0388   REF   3  LAST  294      34,2356  54 163 1          TS      MODE            STORED IN MPAC, MPAC +1
0389   REF  7C  LAST  529      34,2357  0 6006 1          TC      INTPRET
0390                           34,2360   54201 0          SETPD   SL              32(PITCH(32REV)) = PITCH(REV)
0391                           34,2361   00001 0                  0
0392                           34,2362   20206 1                  5
0393                           34,2363   77606 1          PUSH                    LET  P(RAD) = 2*PI*PITCH(REV)

0394                           34,2364   77650 1          GOTO
0395   REF   1                 34,2365   76103 1                  ATTDISP1        AROUND SETLOC
A0396                                                                  *
A0397                                   CONSTRUCT SM TO S/C MATRIX, TSMV

0398   REF   1                 37,2000                    SETLOC  P11TWO
0399                           37,2103                    BANK                    36 IN COL., 34 IN DISK

0400   REF   1                                            COUNT   36/P11

0401                           37,2103   57546 1  ATTDISP1 COS     DCOMP
0402                           37,2104   14017 1          STODL   14D             -.5*COS(P)
0403                           37,2105   77756 0          SIN
0404                           37,2106   14013 0          STODL   10D             .5*SIN(P)
0405   REF   6  LAST  469      37,2107   15332 1                  ZEROVECS
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 0406                          37,2110   00015 C          STORE  12D              0

AC407                                          EVALUATE ROLL = LAUNCHAZ-AZIMUTH-.5*SATRLRT*T
 0409                          37,2111   41335 1          SLOAD  DMP
 0410  REF   3  LAST  531      37,2112   03310 C                 SPOLYARG         TIME1 - RPSTART ,CSECS B-14.
 0411  REF   4  LAST  527      37,2113   03301 C                 SATRLRT
 0412                          37,2114   45261 C          SL     DSU
 0413                          37,2115   20217 1                 14D
 0414  REF  12  LAST  527      37,2116   15330 C                 DPHALF
 0415                          37,2117   45215 C          DAD    DSU              ASSUMING X(SM) ALONG LAUNCH AZIMUTH,
 0416  REF   8  LAST  527      37,2120   02634 1                 LAUNCHAZ         LAUNCHAZ = ANGLE FROM NORTH TO X(SM).
 0417  REF   6  LAST  527      37,2121   02401 C                 AZIMUTH          AZIMUTH = -ANGLE FROM NORTH TO Z(S/C)
 0418                          37,2122   77634 0          RTB                     DETERMINE IF ROLLOUT
 0419  REF   1                 37,2123   70473 C                 RLTST            IS COMPLETED
 0421                          37,2124   71406 C ATTDISPR PUSH   COS              CONTINUE COMPUTING TSMV
 0422                          37,2125   77606 1          PUSH                    LET  R(RAD) = 2*PI*ROLL(REV)
 0423                          37,2126   72405 C          DMP    SL1
 0424                          37,2127   00017 1                 14D
 0425                          37,2130   14027 1          STODL  22D              -.5*COS(R)*COS(P)
 0426                          37,2131   77676 C          DCOMP
 0427                          37,2132   00023 C          STORE  18D              -.5*COS(R)
 0428                          37,2133   72405 C          DMP    SL1
 0429                          37,2134   00013 C                 10D
 0430                          37,2135   14033 1          STODL  26D              -.5*COS(R)*SIN(P)
 0431                          37,2136   41556 1          SIN    PUSH
 0432                          37,2137   00031 C          STORE  24D              .5*SIN(R)
 0433                          37,2140   72405 C          DMP    SL1
 0434                          37,2141   00017 1                 14D
 0435                          37,2142   14021 1          STODL  16D              -.5*SIN(R)*COS(P)
 0436                          37,2143   77676 C          DCOMP
 0437                          37,2144   72405 C          DMP    SL1
 0438                          37,2145   00013 C                 10D
 0439                          37,2146   24025 C          STOVL  20D              -.5*SIN(R)*SIN(P)
 0440                          37,2147   00013 C                 10D

AC441                                          FROM TSMV FIND THE HALF UNIT VECTORS  XDC,YDC,ZDC = INPUT TO CALCGTA
 0442                          37,2150   77656 1          UNIT
 0443  REF   3  LAST   92      37,2151   26714 1          STOVL  XDC              XDC = .5*UNIT(SIN(P),0,-COS(P))
 0444                          37,2152   00021 1                 16D
 0445                          37,2153   77656 1          UNIT
 0446  REF   3  LAST   92      37,2154   26722 1          STOVL  YDC              YDC = .5*UNIT(-SIN(R)*COS(P),-COS(R),
 0447                          37,2155   00027 1                 22D                                    -SIN(R)*SIN(P))
 0448                          37,2156   77656 1          UNIT
 0449  REF   3  LAST   92      37,2157   36730 C          STCALL ZDC              ZDC = .5*UNIT(-COS(R)*COS(P),SIN(R),
 0450  REF   2  LAST  442      37,2160   47140 1                 CALCGTA                                -COS(R)*SIN(P))

AC451                                          CALL CALCGTA TO COMPUTE DESIRED SM ORIENTATION  OGC,IGC,AND MGC
AC452                                                                          - - -
AC453                                          FIND DIFFERENCE VECTOR   DELTACDU = OGC-CDUX
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A04531 ENTER HERE IF ATTITUDE HOLD

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0454                          37,2161  41575 C  NOPOLYM  VLOAD   PUSH      OGC      IGC
0455  REF  15  LAST  526      37,2162  02760 1                   OGC       CHANGE IGC  TO  MGC FOR COMPATIBILITY
0456                          37,2163  45006 C           PUSH    CALL      MGC      OGC
0457  REF   2  LAST  495      37,2164  47432 1                   CDUTRIG   WITH Y,Z,X ORDER OF CDUSPOT
0458                          37,2165  47175 1           VLOAD   RTB       -        DPHI     OGC-CDUX ,PD4
0459                          37,2166  00003 1                   2         DELTACDU = DTHETA = IGC-CDUY ,   0
0460  REF   3  LAST  405      37,2167  45547 C                   V1STO2S             DPSI     MGC-CDUZ ,   2
0461  REF   1                 37,2170  27317 1           STOVL   BOOSTEMP
0462  REF   7  LAST  531      37,2171  15332 1                   ZEROVECS
0463                          37,2172  24001 0           STOVL   0
0464  REF   5  LAST  445      37,2173  00767 1                   CDUSPOT
0465                          37,2174  47034 C           RTB     RTB
0466  REF   4  LAST  533      37,2175  45547 C                   V1STO2S
0467  REF   1                 37,2176  70453 1                   DELSTOR
0468                          37,2177  14013 C           STODL   10D
0469  REF   1                 37,2200  00741 C                   SINCDUZ
0470                          37,2201  72405 C           DMP     SL1
0471                          37,2202  00001 0                   0
0472                          37,2203  60415 1           DAD     SR2       CHANGE SCALE OF AK TO 2REVS
0473                          37,2204  00005 1                   4
0474                          37,2205  77650 1           GOTO
0475  REF   1                 37,2206  70366 0                   ATTDISP2

0476  REF   2  LAST  524      34,2000                    SETLOC  P11ONE
0477                          34,2366                    BANK
0478  REF   2 LAST  524 TO  531:   244   244*           COUNT   34/P11

0479                          34,2366  14021 1  ATTDISP2  STODL   16D       16D,  .5(DPHI + DTHETA*SIN(CDUZ))
0480  REF   1                 34,2367  00747 C                   COSCDUZ
0481                          34,2370  41405 C           DMP     PUSH
0482                          34,2371  00001 C                   0
0483                          34,2372  72405 C           DMP     SL1
0484  REF   1                 34,2373  00751 1                   COSCDUX
0485                          34,2374  41325 C           PDDL    DMP
0486  REF   1                 34,2375  00743 1                   SINCDUX
0487                          34,2376  00003 1                   2
0488                          34,2377  72415 1           DAD     SL1
0489                          34,2400  77626 C           STADR
0490                          34,2401  63755 0           STODL   17D       17D,  .5(DTHETA*COS(CDUX)*COS(CDUZ)
0491                          34,2402  72405 0           DMP     SL1                     +DPSI*SIN(CDUX))
0492  REF   2  LAST  533      34,2403  00743 1                   SINCDUX
0493                          34,2404  41325 C           PDDL    DMP
0494  REF   2  LAST  533      34,2405  00751 1                   COSCDUX
0495                          34,2406  00003 1                   2
0496                          34,2407  72425 1           DSU     SL1
0497                          34,2410  77626 C           STADR
0498                          34,2411  77754 1           STORE   18D       18D,  .5(-DTHETA*SIN(CDUX)*COS(CDUZ)
0499                          34,2412  77751 1           TLOAD                           +DPSI*COS(CDUX))
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0500                              34,2413   00021 1                    16D
0501  REF   9  LAST  243         34,2414   03077 1          STORE     AK          STORE ATTITUDE ERRORS IN AK,AK1,AK2
0502                              34,2415   77776 1          EXIT

A0503                                        DISPLAY ATTITUDE ERRORS ON FDAI VIA NEEDLER

0504  REF 118  LAST  529         34,2416  0 4555 0  SATOUT   TC        BANKCALL
0505  REF   2  LAST  529         34,2417    42404 1          CADR      NEEDLER
0506  REF   2  LAST  346         34,2420  3 4113 0  ATERSET  CAF       OCT31       DELAY .25 SEC
0507  REF 119  LAST  534         34,2421  0 4555 0           TC        BANKCALL    EXECUTION + DELAY =.56SEC APPROX
0508  REF   6  LAST  509         34,2422    01730 1          CADR      DELAYJOB
0509  REF   2  LAST  529         34,2423  0 2326 1          TC        ATERJOB     END OF ATT ERROR DISPLAY CYCLE

0510  REF  32  LAST  472         34,2424  4 4705 0  SATCLEAR CS        BIT6
0511                              34,2425  0 0006 1          EXTEND
0512  REF  24  LAST  378         34,2426  03 012 1          WAND      CHAN12      CLEAR IMU ERROR COUNTER
0513  REF  26  LAST  527         34,2427  0 5301 0          TC        PHASCHNG    TURN OFF PROTECTION
0514                              34,2430   00004 0          OCT       00004       FOR ATTITUDE ERROR DISPLAY
05141 REF 114  LAST  531         34,2431  3 4714 1          CAF       ZERO
05142 REF  10  LAST  534         34,2432  55'476 1          TS        AK          ZERO OUT
05143 REF   1                    34,2433  55'477 0          TS        AK1         AKS FOR
05144 REF   1                    34,2434  55'500 1          TS        AK2         DOWNLINK
0515  REF  64  LAST  528         34,2435  0 5112 0          TC        ENDOFJOB

0516                              34,2436   51575 1  S11.1    VLOAD     ABVAL
0517  REF   7  LAST  508         34,2437   01177 1           VN
0518  REF   5  LAST  274         34,2440   27723 1          STOVL     VMAGI       VI    SCALED 2(7)  IN METERS/CSEC
0519  REF   7  LAST  508         34,2441   01171 1           RN
0520                              34,2442   45246 0          ABVAL     DSU
0521  REF   4  LAST  508         34,2443   05311 1           RPAD
0522  REF   3  LAST  273         34,2444   27735 0          STOVL     ALTI        H     SCALED 2(29) IN METERS
0523  REF   8  LAST  534         34,2445   01171 1           RN
0524                              34,2446   50256 0          UNIT      DOT
0525  REF   8  LAST  534         34,2447   01177 1           VN
0526                              34,2450   77752 1          SL1
0527  REF   2  LAST  273         34,2451   03737 1          STORE     HDOT        HDOT  SCALED 2(7)  IN METERS/CSEC
0528                              34,2452   77616 0          RVQ
0529  REF   2  LAST  533         34,2453  3 1716 0  DELSTOR  CA        BOOSTEMP
0530                              34,2454  0 0006 1          EXTEND                  STORE DELTACDU INTO PDL 0,2,4
0531  REF 241  LAST  531         34,2455  20 154 0          MSU       MPAC
0532  REF   6  LAST  499         34,2456  50 120 1          INDEX     FIXLOC
0533                              34,2457  54 000 0          TS        0
0534  REF   3  LAST  534         34,2460  3 1717 1          CA        BOOSTEMP +1
0535                              34,2461  0 0006 1          EXTEND
0536  REF 242  LAST  534         34,2462  20 155 1          MSU       MPAC +1
0537  REF   7  LAST  534         34,2463  50 120 1          INDEX     FIXLOC
0538                              34,2464  54 002 1          TS        2
0539  REF   4  LAST  534         34,2465  3 1720 0          CA        BOOSTEMP +2
0540                              34,2466  0 0006 1          EXTEND
0541  REF 243  LAST  534         34,2467  20 156 1          MSU       MPAC +2
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 0542   REF   8  LAST  534    34,2470  50 120 1          INDEX  FIXLOC
 0543                         34,2471  54 004 1          TS     4
 0544   REF   2  LAST  278    34,2472  1 6030 0          TCF    DANZIG
 0545   REF 244  LAST  534    34,2473  3 0154 1  RLTST   CA     MPAC           DETERMINE IF ROLLOUT
 05451                        34,2474  0 0006 1          EXTEND                IS COMPLETED
 05452  REF   5  LAST  532    34,2475  7 1701 1          MP     SATRLRT +1
 05453                        34,2476  0 0006 1          EXTEND
 05454  REF   3  LAST  535    34,2477  6 6030 1          BZMF   DANZIG         UNLIKE SIGNS  STILL ROLLING
 0546                         34,2500  0 0006 1          EXTEND                ROLLOUT COMPLETED
 05461  REF   1                34,2501  3 3563 1          DCA    MBDYTCTL +2    ZERO OUT ROLL CONTRIBUTION
 05462  REF 245  LAST  535    34,2502  52 155 1          DXCH   MPAC
 05463  REF   4  LAST  535    34,2503  0 6030 1          TC     DANZIG
 05464  REF  71  LAST  531    34,2504  0 6006 1  NOPOLY   TC     INTPRET        COMES HERE IF
 05465                        34,2505   52001 1          SETPD  GOTO           ATTITUDE HOLD
 05466                        34,2506   00001 0          0
 05467  REF   1                34,2507   76161 0                 NOPOLYM
 0547   REF   1                34,2510   01673 1  COEFPOLY ADRES  POLYLOC
 0548                         34,2511   01476 0  V06N62   VN     0662
R0552   SATURN TAKEOVER FUNCTION
R0553   **************************

R0554   PROGRAM DESCRIPTION

R0555        MCC NUMBER 1
R0556        MOD BY ELIASSEN

R0557   FUNCTIONAL DESCRIPTION

R0558        DURING THE COASTING PHASE OF SIVB ATTACHED, THE
R0559        ASTRONAUT MAY REQUEST SATURN TAKEOVER THROUGH
R0560        EXTENDED VERB 46 (BITS 13,14 OF DAPDATR1 SET ).
R0561        THE CMC REGARDS RHC COMMANDS AS BODY-AXES RATE
R0562        COMMANDS AND IT TRANSMITS THESE TO SATURN AS DC
R0563        VOLTAGES. THE VALUE OF THE CONSTANT RATE COMMAND
R0564        IS 0.5 DEG/SEC. AN ABSENCE OF RHC ACTIVITY RE-
R0565        SULTS IN A ZERO RATE COMMAND.

R0566        THE FDAI ERROR NEEDLES WILL INDICATE THE VALUE
R0567        OF THE RATE COMMAND.

R0568   CALLING SEQUENCE

R0569        DAPFIG +9D  TC      POSTJUMP
R0570                    CADR    SATSTKON

R0571   SUBROUTINES CALLED

R0572        ENDEXT
R0573        IBNKCALL
R0574        STICKCHK
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R0575       NEEDLER
R0576       TSRUPT
R0577       RESUME

R0578   ASTRONAUT REQUESTS

R0579       ENTRY -  VERB 46 ENTER
R0580                (CONDITION - BITS 13, 14 OF DAPDATR1 SET)

R0581       EXIT  -  VERB 48 ENTER  (FLASH V06N46)
R0582                VERB 21 ENTER  XXXXX ENTER WHERE  X=0 OR 1
R0583                VERB 34 ENTER
R0584                VERB 46 ENTER

R0585   NORMAL EXIT MODE

R0586                VERB 46 ENTER  (SEE ASTRONAUT ABOVE)

R0587   ALARM OR ABORT EXIT MODES

R0588       NONE

R0589   OUTPUT

R0590       SATURN RATES IN  CDUXCMD, CDUYCMD, CDUZCMD

R0591   ERASABLE INITIALIZATION

R0592       DAPDATR1  (BITS 13,14 MUST BE SET)

R0593   DEBRIS

R0594       CENTRALS
R0595       CDUXCMD, CDUYCMD, CDUZCMD

 0596                              43,3210                    BANK   43
 0597   REF   3  LAST  241        43,2000                    SETLOC EXTVERBS
 0598                              43,3210                    BANK

 0599   REF   1                                               COUNT  23/STTKE
 0600                              43,3210  0 0006 1 SATSTKON EXTEND
 06001  REF   1                   43,3211  3 3226 1          DCA    2REDCSAT
 06002                             43,3212  0 0004 0          INHINT
 06003  REF   5  LAST  254        43,3213  53'313 0          DXCH   T5LOC
 06004  REF  12  LAST  422        43,3214  3 4672 0          CAF    POSMAX
 0601   REF   3  LAST  185        43,3215  54 030 0          TS     TIME5
 06011  REF  10  LAST  530        43,3216  4 0102 0          CS     FLAGWRD6     TURN ON BITS 15,14 OF
 06012  REF   2  LAST  129        43,3217  7 4105 0          MASK   RELTAB11     FLAGWRD6
 06013  REF  11  LAST  536        43,3220  26 102 0          ADS    FLAGWRD6        SATSTICK CONTROL OF T5
 060132 REF  22  LAST  529        43,3221  0 4633 0          TC     IBNKCALL     ZERO JET CHANNELS IN 14 MS AND THEN
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060134 REF   1              43,3222   42616 C          CADR    ZEROJET         LEAVE THE T6 CLOCK DISABLED
06014                       43,3223   C 0003 1         RELINT
06015  REF  27  LAST  260   43,3224   0 2125 C         TC      GOPIN           EXIT THUS BECAUSE WE CAME VIA V46

060151 REF   7  LAST  529   E6,1704                    EBANK=  BODY3
06016  REF   2  LAST  187   43,3225   02765 1  2REDOSAT 2CADR   REDOSAT
06016                       43,3226   46106 1

060162                      32,2017                    BANK    32
060164 REF   1              23,2000                    SETLOC  P11FCUR
060166                      23,2765                    BANK

0602   REF   3  LAST  218   23,2765   22 016 C  REDOSAT LXCH    BANKRUPT        ALSO COMES HERE FOR RESTARTS
06021                       23,2766   0 0006 1         EXTEND
06022  REF   3  LAST  218   23,2767   22 012 1         QXCH    QRUPT
06023  REF   8  LAST  529   23,2770   4 1501 C         CS      RCSFLAGS        TURN ON BIT3 OF RCSFLAGX
06024  REF  18  LAST  529   23,2771   7 4710 1         MASK    BIT3            FOR
06025  REF   9  LAST  537   23,2772   27'501 C         ADS     RCSFLAGS        NEEDLER INITIALIZATION
0603   REF  23  LAST  536   23,2773   0 4633 C         TC      IBNKCALL
0604   REF   3  LAST  534   23,2774    42404 1         CADR    NEEDLER         DISABLE IMU ERR COUNTERS ETC.
0605   REF  18  LAST  250   23,2775   3 4702 C         CAF     BIT9            SIVB
0606                       23,2776   0 0006 1         EXTEND                  TAKEOVER
0607   REF  25  LAST  534   23,2777   05 012 1         WOR     CHAN12          ENABLE
0608                       23,3000   0 0006 1         EXTEND                  SET UP T5 CYCLE
0609   REF   1              23,3001   3 3046 C         DCA     2SATSTCK
0610   REF   6  LAST  536   23,3002   53'313 C         DXCH    T5LOC
0611   REF   1              23,3003   3 3044 1         CAF     100MST5         IN 100 MSECS
0612   REF   4  LAST  536   23,3004   54 030 C         TS      TIME5
0613   REF  25  LAST  227   23,3005   1 5222 1         TCF     RESUME          END OF SATURN STICK INITIALIZATION

A0614                                  THIS SECTION IS EXECUTED EVERY 100 MSECS

0615   REF   4  LAST  537   23,3006   22 016 C  SATSTICK LXCH    BANKRUPT
0616                       23,3007   0 0006 1         EXTEND
0617   REF   4  LAST  537   23,3010   22 012 1         QXCH    QRUPT

0618   REF   2  LAST  537   23,3011   3 3045 C         CAF     2SATSTCK        SET UP RUPT
0619   REF   7  LAST  537   23,3012   55'312 1         TS      T5LOC           LO ORDER LOC SET
0620   REF   2  LAST  537   23,3013   3 3044 1         CAF     100MST5         100 MSECS
0621   REF   5  LAST  537   23,3014   54 030 C         TS      TIME5
0622   REF   1              23,3015   3 3043 C         CAF     STIKBITS
0623                       23,3016   0 0006 1         EXTEND
0624   REF   2  LAST  382   23,3017   06 031 C         RXOR    CHAN31          CHECK IF MAN POT BITS SAME
0625   REF   2  LAST  537   23,3020   7 3043 1         MASK    STIKBITS
0626   REF  24  LAST  537   23,3021   0 4633 C         TC      IBNKCALL        SET RATE INDICES
0627   REF   1              23,3022    43114 1         CADR    STICKCHK        FOR PITCH YAW AND ROLL

0628   REF   2  LAST  107   23,3023   51'656 C         INDEX   RHANNDX         SET SATURN RATES
0629   REF   1              23,3024   3 3037 C         CA      SATRATE
0630   REF  11  LAST  534   23,3025   55'476 1         TS      AK                              ROLL
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0631   REF   2  LAST  107   23,3026  51'657 1          INDEX  PMANNDX
0632   REF   2  LAST  537   23,3027  3 3037 0          CA     SATRATE
0633   REF   2  LAST  534   23,3030  55'477 0          TS     AK1                    PITCH
0634   REF   2  LAST  111   23,3031  51'660 0          INDEX  YMANNDX
0635   REF   3  LAST  538   23,3032  3 3037 0          CA     SATRATE
0636   REF   2  LAST  534   23,3033  55'500 1          TS     AK2                    YAW

0637   REF  25  LAST  537   23,3034  0 4633 0          TC     IBNKCALL    FOR SATURN INTERFACE AND FDAI DISPLAY
0638   REF   4  LAST  537   23,3035   42404 1          CADR   NEEDLER
0639   REF  26  LAST  537   23,3036  1 5222 1          TCF    RESUME      END OF SATURN STICK CONTROL


0640                        23,3037   00000 1  SATRATE  DEC    0           IN DETENT - ZERO RATE
0641                        23,3040   00476 1           DEC    +318        POS RATE .50/S R, .30/S P AND Y
0642                        23,3041   77301 0           DEC    -318        NEG RATE       DITTO
0643                        23,3042   00000 1           DEC    0           POS NEG BITS ON  ASSUME IN DETENT

0644                        23,3043   00077 1  STIKBITS OCT    00077
0645                        23,3044   37766 1  100MSTS  DEC    16374
0646   REF   8  LAST  537   E6,1704                    EBANK= BODY3
0647   REF   1              23,3045   03006 1  2SATSTCK 2CADR  SATSTICK
0647   REF   1              23,3046   46106 1
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R2000 PROGRAM DESCRIPTION S17.1 AND S17.2

R2001 FUNCTIONAL DESCRIPTION

R2002 THE TPI SEARCH ROUTINE DETERMINES THE MINIMUM TOTAL VELOCITY TRANSFER TRAJECTORY FROM A GIVEN TPI
R2004 MANEUVER TIME WITHIN THE CONSTRAINT OF A SAFE PERICENTER. THIS VELOCITY IS THE SUM OF THE IMPULSIVE VELOCITIES
R2006 FOR THE TPI AND TPF MANEUVERS.
R2007 THE S17.1 ROUTINE EXTRAPOLATES THE STATE VECTORS OF BOTH VEHICLES TO THE TPI TIME AND COMPUTES THE
R2009 RELATIVE PHASE ANGLE BETWEEN THE VEHICLES, THE ALTITUDE DIFFERENCE(I.E. THE MAGNITUDE DIFFERENCE OF THE
R2011 POSITION VECTORS) AND SELECTS A SEARCH SECTOR BASED ON THE SIGN OF THE ALTITUDE DIFFERENCE.
R2013 THE S17.2 ROUTINE FURTHER DEFINES THE SEARCH SECTOR BY COMPUTING ANGULAR LIMITS AND USES THE TIME THETA
R2015 SUBROUTINE TO COMPUTE THE SEARCH START AND END TIMES. THE SEARCH IS THEN MADE IN AN ITERATIVE LOOP USING THE
R2017 LAMBERT SUBROUTINE TO COMPUTE THE VELOCITIES REQUIRED AT TPI TIME AND AT TPF TIME. EXIT FROM THE SEARCH LOOP
R2019 IS MADE WHEN SOLUTION CRITERIA ARE MET (NORMAL EXIT) OR AS SOON AS IT IS EVIDENT THAT NO SOLUTION EXISTS IN
R2021 THE SECTOR SEARCHED.

R2022 CALLING SEQUENCE

R2023 BOTH ROUTINES ARE CALLED IN INTERPRETIVE CODE AND RETURN VIA QPRET. S17.1 HAS ONLY A NORMAL EXIT.
R2025 S17.2 RETURNS VIA QPRET FOR NORMAL EXIT AND TO ALARUMS FOR ERROR EXIT.
R2028 SUBROUTINES CALLED

R2029 CSMCONIC
R2030 LEMCONIC
R2031 TIMETHET
R2032 INITVEL

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2033                        36,2000                 BANK   36
2034   REF   1              36,2000                 SETLOC P17S
2035                        36,2000                 BANK

2036   REF   1                                      COUNT  36/TPI

2037   REF  17  LAST  518   E7,1537                 EBANK= RACT3

R2038          **** TEMPORARY ****

2039                        36,2000  00004 0  HPE      2DEC   157420.0 B-29   EARTH'S MIN. PERICENTER ALTITUDE 85 N.M.
2039                        36,2001  31566 0

2040                        36,2002  00000 1  HPL      2DEC   10668.0213 B-29 MOON:S MIN. PERICENTER ALTITUDE 35000FT
2040                        36,2003  12326 0
2041                        36,2004  00002 0  CDSEC    2DEC   40000
2041                        36,2005  16100 1
2042                        36,2006  00000 1  CLSEC    2DEC   15000
2042                        36,2007  35230 0
2043                        36,2010  12137 1  PIINVERS 2DEC   .3183098862
2043                        36,2011  06033 1
2044                        36,2012  06161 1  SECITHET 2DEC   .1944444444
2044                        36,2013  30707 1
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2045                          36,2014  35252 1  SEC2THET 2DEC   .9166666667
2045                          36,2015  25253 1
2046                          36,2016  67777 1  MANYFEET 2DEC   -1.0 B-2
2046                          36,2017  77777 C
2047                          36,2020  00000 1  LIMVEL   2DEC   .6096 E-2 B-7   2FPS
2047                          36,2021  30760 C
2048                          36,2022  00000 1  OFTMOON  2DEC   .1524 E3 B-29   500 FEET
2048                          36,2023  00114 C
2049                          36,2024  00040 C  DP-.002  2DEC   0.002
2049                          36,2025  30447 C
2050                          36,2026  71220 1  S17.1     STQ    DLOAD
2051  REF  17 LAST 488        36,2027  01340 1                 NORMEX
2052  REF  10 LAST 462        36,2030  03663 1                 TTPI
2053  REF  22 LAST 52C        36,2031  34041 C          STCALL TDEC1          ADVANCE PASSIVE VEHICLE  TO TPI
2054  REF   1                 36,2032  27057 C                 LEMCONIC
2055                          36,2033  77624 1          CALL
2056  REF   2 LAST 488        36,2034  45372 C                 LEMSTORE
2057                          36,2035  77745 1          DLOAD
2058  REF  11 LAST 54C        36,2036  03663 1                 TTPI
2059  REF  23 LAST 54C        36,2037  34041 C          STCALL TDEC1          ADVANCE  ACTIVE VEHICLE TO TPI
2060  REF   1                 36,2040  27045 C                 CSMCONIC
2061                          36,2041  77624 1          CALL
2062  REF   2 LAST 488        36,2042  45402 C                 CSMSTORE
2063                          36,2043  77775 1          VLOAD
2064  REF  18 LAST 539        36,2044  03540 C                 RACT3
2065                          36,2045  63246 1  ABVAL   PDVL    /RA/ OD               PL  2D
2066  REF   9 LAST 52C        36,2046  03554 C                 RPASS3
2067                          36,2047  65256 C  UNIT    PDDL    UNIT RP OD            PL  6D
2068                          36,2050  43021 C  BDSU    SET
2069                          36,2051  00045 C                 36D                   /RP/ -/RA/
2070  REF   1                 36,2052  00076 C                 KFLAG                 OFF = +
2071                          36,2053  43040 1  BMN     CLEAR
2072                          36,2054  74056 1                 +2
2073  REF   2 LAST 54C        36,2055  00276 1                 KFLAG                 ON  = -
2074  REF   2 LAST 274        36,2056  27754 1  STCVL   DELHITE
2075                          36,2057  00001 0                 OD
2076                          36,2060  53435 C  VXV     UNIT
2077  REF   9 LAST 52C        36,2061  03562 0                 VPASS3
2078  REF   1                 36,2062  27646 0  STCVL   E2                    ALMOST IT SAVE FOR 17.2
2079  REF  19 LAST 54C        36,2063  03540 C                 RACT3
2080                          36,2064  46206 1  PUSH    VPROJ
2081  REF   2 LAST 54C        36,2065  03646 C                 E2
2082                          36,2066  51352 1  VSL2    BVSU    RPA
2083                          36,2067  50256 C  UNIT    DOT
2084                          36,2070  00001 0                 OD
2085                          36,2071  65552 C  SL1     ACOS
2086                          36,2072  77715 1  PDVL
2087                          36,2073  50235 C  VXV     DOT
2088  REF  20 LAST 54C        36,2074  03540 C                 RACT3
2089  REF   3 LAST 54C        36,2075  03646 C                 E2
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 2090                                36,2076  75325 1          PDDL    SIGN
 2091                                36,2077  77626 C          STADR
 2092  REF   3  LAST  274            36,2100  61160 1          STODL   THETZERO        CENTRAL ANGLE
 2093  REF   8  LAST  517            36,2101  00047 1                  X1
 2094  REF   2  LAST  123            36,2102  37746 C          STCALL  XRS             SAVE INDICES FOR FURTHER USE
 2095  REF  18  LAST  540            36,2103  01340 1                  NORMEX          +=ACTIVE AHEAD  -=ACTIVE BEHIND
 2096                                36,2104  77220 1  S17.2   STQ     VLOAD           COMPUTE SEARCH SECTOR LIMITS
 2097  REF   2  LAST  120            36,2105  03657 C                  QTEMP
 2098  REF  21  LAST  540            36,2106  03540 C                  RACT3
 2099                                36,2107  50256 C          UNIT    DOT
 2100  REF   4  LAST  540            36,2110  03646 C                  E2
 2101                                36,2111  75446 C          ABS     SQRT
 2102                                36,2112  43352 1          SL1     DAD
 2103  REF   1                       36,2113  34025 1                  DP-.002         ADD .002 RADIANS TO IT
 2104                                36,2114  57414 1          BON     DCOMP           GIVES CORRECT SINE, COSINE MUST BE
 2105  REF   3  LAST  540            36,2115  00316 C                  KFLAG           COMP. ADD .5 FOR ANGLE
 2106                                36,2116  74117 C                  +1
R2107  PHI(C)=180-(-(THETAZERO +K5IT)), PHI(I)=180-(-(THETAZERO+K2IT))
R2108  SIN(180-ALPHA)=SIN(ALPHA) ETC
 2109                                36,2117  40205 1          DMP     SETPD
 2109C5 REF   1                       36,2120  34011 C                  PIINVERS        REVOLUTIONARY HERES TWO IT
 2110                                36,2121  00001 0                  0D
 2111                                36,2122  45206 1          PUSH    DSU
 2112  REF   4  LAST  541            36,2123  02617 C                  THETZERO
 2113  REF   2  LAST   91            36,2124  02611 C          STORE   IT              PHI(I) , -(THETZERO + K2IT)
 2114                                36,2125  41525 C          PDDL    PUSH
 2115                                36,2126  43342 C          SR1     DAD
 2116                                36,2127  41415 1          DAD     PUSH            PHI(0) , -(THETZERO + K5IT)
 2117                                36,2130  43156 1          SIN     SET
 2118  REF   3  LAST  520            36,2131  03466 C                  RVSW
 2119  REF   4  LAST  520            36,2132  16732 C          STODL   SNTH
 2120                                36,2133  50146 1          COS     BMN
 212005                              36,2134  74136 C                  +2
 21201                               36,2135  77676 C          DCOMP
 2121  REF   4  LAST  520            36,2136  16734 C          STODL   CSTH
 212105 REF   3  LAST  541            36,2137  03746 1                  XRS
 21211  REF   9  LAST  541            36,2140  24047 1          STOVL   X1
 2122  REF  10  LAST  540            36,2141  03554 C                  RPASS3
 2123                                36,2142  77657 0          VSR*
 2124                                36,2143  57176 0                  0,2
 2125  REF   4  LAST  520            36,2144  26657 1          STOVL   RVEC
 2126  REF  10  LAST  540            36,2145  03562 C                  VPASS3
 2127                                36,2146  77657 0          VSR*
 2128                                36,2147  57176 0                  0,2
 2129  REF   6  LAST  520            36,2150  36746 1          STCALL  VVEC
 2130  REF   3  LAST  520            36,2151  24737 1                  TIMETHET
 2131                                36,2152  77745 1          DLOAD                   SAVE START TIME AND GET END TIME
 2132  REF   4  LAST  520            36,2153  00037 C                  T
 2133  REF   2  LAST  123            36,2154  03752 1          STORE   TF
 2134  REF   2  LAST   91            36,2155  16627 C          STODL   TFO
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 2135   REF   3  LAST  541   36,2156   02611 C                 IT
 2136                       36,2157   73406 1          PUSH    SIN
 2137   REF   5  LAST  541   36,2160   16732 C          STODL   SNTH
 2138                       36,2161   50146 1          COS     BMN
 2138C5                     36,2162   74164 1                  +2
 21381                      36,2163   77676 C          DCOMP
 2139   REF   5  LAST  541   36,2164   02734 C          STORE   CSTH
 2140                       36,2165   45150 1          LXA,1   CALL
 2141   REF   4  LAST  541   36,2166   03745 1                  XRS
 2142   REF   4  LAST  541   36,2167   24737 1                  TIMETHET
R2143   INITIALIZE LOOP
 2144                       36,2170   43145 C          DLOAD   CLEAR
 2145   REF   5  LAST  541   36,2171   00037 C                  T
 2146   REF   5  LAST  459   36,2172   03661 C                  ITSWICH
 2147   REF   2  LAST   91   36,2173   16621 C          STODL   TFI          SAVE TIME FOR LOOP TEST
 2148   REF   6  LAST  495   36,2174   15340 1                  DPPOSMAX
 2149   REF   2  LAST   91   36,2175   16623 1          STODL   DELVEE
 2150   REF   1              36,2176   34017 C                  MANYFEET
 2151   REF   2  LAST   91   36,2177   16625 1          STODL   HP
 2152   REF   1              36,2200   34013 1                  SEC1THET    70 DEGREES
 2153                       36,2201   71214 C          BON     DLOAD
 2154   REF   4  LAST  541   36,2202   00316 C                  KFLAG
 2155                       36,2203   74205 C                  +2
 2156   REF   1              36,2204   34015 1                  SEC2THET    330 DEGREES
 2157   REF   2  LAST  123   36,2205   37750 1          STCALL  THETL
 2158   REF   1              36,2206   74230 C                  CONCAUL
 2159                       36,2207   70545 1  BIS     DLOAD   SR1
 2160   REF   6  LAST  542   36,2210   02734 C                  CSTH
 2161   REF   2  LAST  28C   36,2211   14021 1          STODL   COSTH
 2162   REF   6  LAST  542   36,2212   02732 C                  SNTH
 2163                       36,2213   77742 C          SR1
 2164   REF   2  LAST  28C   36,2214   34023 1          STCALL  SINTH        GET 4 QUADRANT THETA
 2165   REF   2  LAST  28C   36,2215   47211 C                  ARCTRIG
 2166                       36,2216   43244 1          BPL     DAD
 2167                       36,2217   74221 C                  +2
 2168   REF   7  LAST  542   36,2220   15340 1                  DPPOSMAX    PUT THETA BETWEEN 0,1
 2169                       36,2221   65221 C          BDSU    PDDL
 2170   REF   3  LAST  542   36,2222   03750 C                  THETL
 2171   REF   3  LAST  541   36,2223   03752 1                  TF
 2172                       36,2224   75225 C          DSU     SIGN         FAST TIMES
 2173   REF   3  LAST  542   36,2225   02621 C                  TFI
 2174                       36,2226   77640 C          BMN
 2175   REF   1              36,2227   74432 1                  RNGETEST    TIME MUST HAVE A STOP
R2176   ADVANCE PASSIVE FOR TARGET VECTOR
 2177                       36,2230   77745 1  CONCAUL DLOAD
 2178   REF  12  LAST  54C   36,2231   03663 1                  TTPI
 2179                       36,2232   43015 1          DAD     BON
 2180   REF   4  LAST  542   36,2233   03752 1                  TF
 2181   REF   5  LAST  52C   36,2234   01312 C                  AVFLAG
 2182   REF   1              36,2235   74242 C                  ADVCSM
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 2183    REF  24  LAST  540   36,2236   34041 C            STCALL TDEC1
 2184    REF   2  LAST  540   36,2237   27057 C                   LEMCONIC
 2185                         36,2240   77650 1            GOTO
 2186    REF   1              36,2241   74244 0                   JUNCT3
 2187    REF  25  LAST  543   36,2242   34041 C  ADVCSM    STCALL TDEC1
 2188    REF   2  LAST  540   36,2243   27045 C                   CSMCONIC
R2189    SAVE BACK VALUES OF HP AND DELVEE
 2190                         36,2244   77775 1  JUNCT3    VLOAD
 2191    REF  12  LAST  517   36,2245   00007 0                   VATT
 2192    REF   5  LAST  518   36,2246   27640 0            STOVL  VPASS4
 2193    REF  16  LAST  517   36,2247   00001 0                   RATT
 2194    REF   2  LAST  120   36,2250   03632 0            STORE  RPASS4
 219405  REF   9  LAST  481   36,2251   17415 1            STODL  RTARG
 2195    REF   5  LAST  542   36,2252   03752 1                   TF
 2196    REF   7  LAST  480   36,2253   17423 1            STODL  DELLT4
 2197    REF   3  LAST  542   36,2254   02625 1                   HP
 2198    REF   2  LAST   91   36,2255   16631 1            STODL  HPD
 2199    REF   3  LAST  542   36,2256   02623 1                   DELVEE
 2200    REF   2  LAST   91   36,2257   16633 0            STODL  DELVED
R2201    PREPARE FOR LAMBERT
 2202    REF  13  LAST  542   36,2260   03663 1                   TTPI
 2203    REF   8  LAST  517   36,2261   17503 1            STODL  INTIME
 220305  REF   5  LAST  542   36,2262   03746 1                   XRS
 22031   REF   8  LAST  489   36,2263   17746 1            STODL  RTX1
 220315  REF   3  LAST  526   36,2264   15332 1                   HI6ZEROS
 220315                       36,2265   65201 1            SETPD  PDDL
 22032                        36,2266   00001 0                   DD
 220325  REF   2  LAST  465   36,2267   33147 0                   EPSFCUR
 22033                        36,2270   77715 1            PDVL
 220335  REF  22  LAST  541   36,2271   03540 0                   RACT3
 22034   REF  10  LAST  483   36,2272   27570 0            STOVL  RINIT
 220345  REF   8  LAST  488   36,2273   03546 0                   VACT3
 22035   REF   9  LAST  483   36,2274   37576 1            STCALL VINIT
 2207    REF   2  LAST  465   36,2275   22000 1                   INITVEL
R2208    COMPLETE ET CETERA
 2209                         36,2276   52375 1            VLOAD  VSU
 2210    REF   8  LAST  518   36,2277   03620 0                   VTPRIME
 2211    REF   6  LAST  543   36,2300   03640 0                   VPASS4
 2212                         36,2301   41446 1            ABVAL  PUSH
 2213    REF   2  LAST   91   36,2302   26637 1            STOVL  RELDELV      /V2-VP(TPI+TF)/
 2214    REF  14  LAST  518   36,2303   03646 0                   DELVEET3      V1-VA
 2215                         36,2304   77646 0            ABVAL                 /V1-VA/
 2216    REF   2  LAST   91   36,2305   02635 0            STORE  MAGVTPI
 2217                         36,2306   45415 0            DAD    STADR
 2218    REF   4  LAST  543   36,2307   61154 0            STODL  DELVEE
 2219    REF   6  LAST  543   36,2310   03746 1                   XRS
 2220    REF  10  LAST  541   36,2311   24047 1            STOVL  X1
 2221    REF  10  LAST  518   36,2312   03612 1                   VIPRIME
 2222                         36,2313   77657 0            VSR*
 2223                         36,2314   57176 0                   0,2
```

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2224  REF   7  LAST  541   36,2315  26746 C          STOVL  VVEC
2225  REF  23  LAST  543   36,2316  03540 C                 RACT3
2226                       36,2317  77657 C          VSR*
2227                       36,2320  57176 C                 0,2
2228  REF   5  LAST  541   36,2321  36657 C          STCALL RVEC
2229  REF   1              36,2322  45322 C                 PERIAPO
2230                       36,2323  71354 C          LXA,2  DLOAD
2231  REF   7  LAST  543   36,2324  03746 1                 XRS +1
2232                       36,2325  77657 C          SL*
2233                       36,2326  57576 1                 0,2
2234  REF   4  LAST  543   36,2327  02625 1          STORE  HP
R2235 ITSWICH DENOTES INTERPOLATION--SOLUTION ACCEPTANCE IS FORCED
2236                       36,2330  71214 C          BON    DLOAD
2237  REF   6  LAST  542   36,2331  03701 1                 ITSWICH
2238  REF   1              36,2332  74443 1                 ENDEX
2239  REF   7  LAST  512   36,2333  02321 C                 HPERMIN
2240                       36,2334  50025 C          DSU    BMN
2241  REF   5  LAST  544   36,2335  02625 1                 HP
2242  REF   1              36,2336  74401 1                 HALFSAFE
2243                       36,2337  45325 1          PDDL   DSU            WAS PERICENTER ALT SAFE
2244  REF   8  LAST  544   36,2340  02321 C                 HPERMIN
2245  REF   3  LAST  543   36,2341  02631 1                 HPD
2246                       36,2342  45240 C          BMN    DSU            (HPLIM-HPD)-(HPLIM-HP)=HP-HPD
2247  REF   1              36,2343  74360 1                 INTERP         SOLUTION AT HAND
2248                       36,2344  71240 1          BMN    DLOAD
2249  REF   1              36,2345  73534 1                 ALARUMS        ITS GETTING WORSE - SOUND THE ALARM
2250  REF   1              36,2346  34005 C                 CDSEC
2251                       36,2347  57414 1  JUNCT1  BOFF  DCOMP          OFF IS PLUS ON IS MINUS
2252  REF   5  LAST  542   36,2350  00356 1                 KFLAG
2253                       36,2351  74352 C                 +1
2254  REF   2  LAST  123   36,2352  03744 C          STORE  DELTEE
2255                       36,2353  43345 1  JUNCT2  DLOAD  DAD
2256  REF   3  LAST  544   36,2354  03744 C                 DELTEE
2257  REF   6  LAST  543   36,2355  03752 1                 TF
2258  REF   7  LAST  544   36,2356  37752 C          STCALL TF
2259  REF   1              36,2357  74207 1                 BIS            RECYCLE
2260                       36,2360  45214 1  INTERP  SET    DSU            HP-HPD
2261  REF   7  LAST  544   36,2361  03461 1                 ITSWICH
2262                       36,2362  65301 C          NORM   PDDL
2263  REF  11  LAST  543   36,2363  00047 1                 X1
2264  REF   1              36,2364  34023 1                 DFTMCDN
2265                       36,2365  45215 C          DAD    DSU
2266  REF   9  LAST  544   36,2366  02321 C                 HPERMIN
2267  REF   6  LAST  544   36,2367  02625 1                 HP
2268                       36,2370  70501 1          NORM   SR1
2269  REF   6  LAST  506   36,2371  00050 1                 X2
2270                       36,2372  56264 1          XSU,2  DDV
2271  REF  12  LAST  544   36,2373  00046 C                 X1
2272                       36,2374  53605 1          DMP    SR*
2273  REF   4  LAST  544   36,2375  03744 C                 DELTEE
```

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2274                                36,2376  57177 1                 0 -1,2
2275  REF   5  LAST  544           36,2377  37744 1           STCALL DELTEE
2276  REF   1                      36,2400  74353 1                 JUNCT2
2277                                36,2401  45325 1  HALFSAFE PDDL  DSU          SAVE HP-HPLIM FOR POSSIBLE
2278  REF   5  LAST  543           36,2402  02623 1                 DELVEE
2279  REF   3  LAST  543           36,2403  02633 0                 DELVEO         SAVE THIS TOO
2280                                36,2404  51406 1           PUSH  ABS
2281                                36,2405  50025 0           DSU   BMN
2282  REF   1                      36,2406  34021 0                 LIMVEL         2 FT PS
2283  REF   2  LAST  544           36,2407  74443 1                 ENDEN
2284                                36,2410  45345 1           DLOAD DSU
2285  REF  10  LAST  544           36,2411  02321 0                 HPERMIN
2286  REF   4  LAST  544           36,2412  02631 1                 HPO
2287                                36,2413  77725 1           PDDL
2288                                36,2414  71240 1           BMN   DLOAD
2289  REF   1                      36,2415  74424 0                 LRGRDVO
2290                                36,2416  71244 0           BPL   DLOAD
2291  REF   2  LAST  544           36,2417  74360 1                 INTERP
2292  REF   6  LAST  545           36,2420  03744 0                 DELTEE
2293                                36,2421  57542 0           SR1   DCOMP
2294  REF   7  LAST  545           36,2422  37744 1           STCALL DELTEE
2295  REF   2  LAST  545           36,2423  74353 1                 JUNCT2
2296                                36,2424  77745 1  LRGRDVO  DLOAD
2297                                36,2425  71240 1           BMN   DLOAD
2298  REF   3  LAST  545           36,2426  74353 1                 JUNCT2
2299  REF   1                      36,2427  34007 1                 CLSEC
2300                                36,2430  77650 1           GOTO
2301  REF   1                      36,2431  74347 1                 JUNCT1
R2302 TIME RAN OUT ASSUME SOLUTION IF SAFE PERICENTER
2303                                36,2432  45345 1  RNGETEST DLOAD DSU
2304  REF   7  LAST  544           36,2433  02625 1                 HP
2305  REF  11  LAST  545           36,2434  02321 0                 HPERMIN
2306                                36,2435  71240 1           BMN   DLOAD
2307  REF   2  LAST  544           36,2436  73534 1                 ALARMS
2308  REF   8  LAST  544           36,2437  03752 1                 TF
2309                                36,2440  77625 0           DSU
2310  REF   8  LAST  545           36,2441  03744 0                 DELTEE
2311  REF   9  LAST  545           36,2442  03752 1           STORE TF             TIME OF SOLUTION
2312                                36,2443  77775 1  ENDEN    VLOAD
2313  REF   9  LAST  543           36,2444  03620 0                 VTPRIME
2314                                36,2445  65241 0           DOT   PDDL         SG2 WITH MAGNITUDE
2315  REF   3  LAST  543           36,2446  03632 0                 RPASS4
2316  REF   3  LAST  543           36,2447  02637 1                 RELDELV
2317                                36,2450  45565 0           SIGN  STADR        NOW SIGN(RELDELV)=SIGN(SG2)
2318  REF   4  LAST  545           36,2451  41140 1           STCALL RELDELV
2318C5 REF   1                      36,2452  16440 0                 TRANSANG       COMPUTE OMEGA T , CENTRAL ANGLE
23181                               36,2453  50375 0           VLOAD DOT
2319  REF  24  LAST  544           36,2454  03540 0                 RACT3
2320  REF  11  LAST  543           36,2455  03612 1                 VIPRIME        SG1
2321                                36,2456  51165 1           SIGN  BPL          IF POSITIVE THEN SG1 = SG2 OTHERWISE
```

```
 2322   REF   5  LAST  549   36,2457   02637 1                    RELDELV
 2323   REF   1              36,2460   74470 1                    USEKAY        SIGN(SG2-SG1)=SIGN(SG2)=SIGN(RELDELV)
 2324                        36,2461   57535 0          SLOAD     DCOMP
 2325   REF   2  LAST  469   36,2462   33144 0                    DECTWO
 2326                        36,2463   51165 1          SIGN      BPL
 2327   REF   6  LAST  546   36,2464   02637 1                    RELDELV
 2328   REF   1              36,2465   74476 1                    NEXUS
 2328C5                      36,2466   52076 1          DCOMP     GOTO
 23281  REF   2  LAST  546   36,2467   74474 0                    USEKAY +4
 2329                        36,2470   43135 1  USEKAY  SLOAD     BON
 2330   REF   3  LAST  546   36,2471   33144 0                    DECTWO
 2331   REF   6  LAST  544   36,2472   00316 0                    KFLAG
 2332   REF   2  LAST  546   36,2473   74476 1                    NEXUS
 2333                        36,2474   77625 0          DSU
 2334   REF   2  LAST  448   36,2475   36100 0                    P21CNENN
 2335   REF   2  LAST  273   36,2476   17646 0  NEXUS   STODL     NN1
 2335C5 REF   8  LAST  545   36,2477   02625 1                    HP
 2336   REF   4  LAST  518   36,2500   36641 1          STCALL    POSTTPI
 2337   REF   3  LAST  541   36,2501   03657 0                    QTEMP
 23371                       07,2440             BANK    07
 23372  REF   1              07,2000             SETLOC  XANG
 23373                       07,2440             BANK
 23374  REF   1              07,2465             COUNT   07/XANG
```

R2338 CENTRAL ANGLE SUBROUTINE
R2339 THIS SUBRCUTINE COMPUTES THE CENTRAL ANGLE OF TRAVEL OF THE
R2340 PASSIVE VEHICLE DURING THE TRANSFER.

```
 2341                        07,2440   40220 0  TRANSANG STQ      SETPD
 2342   REF  15  LAST  517   07,2441   02370 1                    SUBEXIT
 2343                        07,2442   00001 0                    0
 2344                        07,2443   73150 1          LXA,1     LXA,2
 2345   REF   8  LAST  544   07,2444   03745 1                    XRS
 2346   REF   9  LAST  546   07,2445   03746 1                    XRS +1
 2347                        07,2446   53775 1          VLOAD     VSR*
 2348   REF   7  LAST  543   07,2447   03640 0                    VPASS4
 2349                        07,2450   57176 0                    0,2
 2350   REF   8  LAST  544   07,2451   22746 1          STODL*    VVEC
 2351   REF   3  LAST  484   07,2452   11630 1                    MUTABLE +2,1
 2352                        07,2453   53715 1          PDVL      VSR*          SQRT MU  (+18 OR +15)          00D
 2353   REF   4  LAST  545   07,2454   03632 0                    RPASS4
 2354                        07,2455   57176 0                    0,2
 2355                        07,2456   64646 1          ABVAL     PDDL*         MAGNITUDE OF R  (+29 OR +27)   02D
 2356   REF   4  LAST  546   07,2457   11626 0                    MUTABLE,1
 2357                        07,2460   47515 0          PDVL      VSQ           1/MU  (+34 OR +28)             04D
 2358   REF   9  LAST  546   07,2461   02746 0                    VVEC
 2359                        07,2462   57301 1          NORM      DMPR          PUSH LIST AT 02D
 2360   REF  13  LAST  544   07,2463   00047 1                    X1
 2361                        07,2464   53605 1          DMP       SRR*
 2362                        07,2465   00003 1                    02D
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2363                                07,2466  21576 C                 0 -3,1
2364                                07,2467  77621 1          BDSU                R V**/MU  (+6)
2365   REF   1                     07,2470  11503 1                 D1/32
2366                                07,2471  65301 C          NORM   PDDL
2367   REF  14  LAST  546          07,2472  00047 1                 X1              (2 - R V**/MU)      (+6-N)
2368                                07,2473  56362 C          SR1R   DDV             MAGNITUDE OF R      (+30 OR +28)
2369                                07,2474  41457 1          SL*    PUSH            R/(2 - R V**/MU)    (+29 OR +27)02D
2370                                07,2475  20174 1                 0 -5,1
2371                                07,2476  75542 C          SR1    SQRT
2372                                07,2477  77605 1          DMP
2373                                07,2500  65301 C          NORM   PDDL            ASUBP***                        00D
2374   REF  15  LAST  547          07,2501  00047 1                 X1
2375                                07,2502  56342 1          SR1    DDV
2376                                07,2503  53605 1          DMP    SL*
2377   REF  10  LAST  545          07,2504  03752 1                 TF
2378                                07,2505  20201 C                 0,1
2378C5                              07,2506  60325 C          PDDL   NORM
23781  REF   1                     07,2507  11515 C                 2PISC
237815 REF  16  LAST  547          07,2510  00047 1                 X1
23782                               07,2511  56325 C          PDDL   DDV
237825                              07,2512  77657 C          SL*
23783                               07,2513  20176 C                 0 -3,1          CENTANG = (SQRT(MU/ASUP***)TF)
2379   REF   6  LAST  520          07,2514  37754 C          STCALL CENTANG         IN REVOLUTIONS B-0
2380   REF  16  LAST  546          07,2515  02370 1                 SUBEXIT
2381                               35,3431                  BANK   35
2382   REF   1                     35,2000                  SETLOC P17S1
2383                               35,3431                  BANK
23835  REF   1                                              COUNT  35/P17

R2384  TPI SEARCH DISPLAY ROUTINE

2385   REF   5  LAST  519          35,3431  0 3726 1  P17   TC     AVFLAGA         AVFLAG = CSM , SET TRACK + UPDATE FLAGS
2386   REF   1                     35,3432  0 3434 1        TC     P17.1
2387   REF   5  LAST  519          35,3433  0 3741 C  P77   TC     AVFLAGP         AVFLAG = LEM , SET TRACK + UPDATE FLAGS
2388   REF   5  LAST  519          35,3434  0 3746 1  P17.1 TC     P20FLGON         SET UPDATE FLAG
2388C5 REF   3  LAST  454          35,3435  3 3125 1        CAF    V06N37          DISPLAY TTPI TIME
2389   REF   5  LAST  470          35,3436  0 3114 C        TC     VNPOCH
2390   REF  72  LAST  535          35,3437  0 6006 1        TC     INTPRET
2391                               35,3440   45014 C        CLEAR  CALL
2392   REF   6  LAST  518          35,3441   00670 C               UPDATFLG
2393   REF   1                     35,3442   74026 C               S17.1           UPDATE STATE VECTORS TO TTPI
2394                               35,3443   76014 C        SET    AXT,1
2395   REF   7  LAST  547          35,3444   00470 1               UPDATFLG
2396                               35,3445   00002 C        DEC    2               DELTA H = 2  K POSITIVE , KFLAG OFF
2397                               35,3446   76014 C        BOFF   AXT,1
2398   REF   7  LAST  546          35,3447   00356 1               KFLAG
2399                               35,3450   73452 C               +2
2400                               35,3451   00001 C        DEC    1               DELTA H = 1  K NEGATIVE , KFLAG ON
2401                               35,3452   77530 1        SXA,1  EXIT
2402   REF   6  LAST  516          35,3453   01132 C               OPTION2
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2403   REF   1                 35,3454   3 3543 C            CAF     V06N72      DISPLAY PHI , DELTA H , SEARCH OPTION K
2404   REF   1                 35,3455   0 3517 1            TC      VNCOMP17
2405   REF  73  LAST  547      35,3456   0 6006 1            TC      INTPRET
2406                           35,3457    43014 0            CLEAR   SET
2407   REF   8  LAST  547      35,3460    00670 0                    UPDATFLG
2408   REF   8  LAST  547      35,3461    00076 0                    KFLAG
2409                           35,3462    45335 0            SLOAD   DSU
2410   REF   7  LAST  547      35,3463    01133 1                    OPTION2     RESET KFLAG ON FOR OPTION =1
2411   REF   3  LAST  546      35,3464    36100 0                    P21ONENN                OFF FOR OPTION =2
2412                           35,3465    43030 0            BHIZ    CLEAR
2413                           35,3466    73470 0                    +2
2414   REF   9  LAST  548      35,3467    00276 1                    KFLAG
2415                           35,3470    46135 1            SLOAD   BHIZ
2416   REF  10  LAST  546      35,3471    03747 0                    XRS +1
2417                           35,3472    73476 0                    +4
2418                           35,3473    52145 0            DLOAD   GOTO
2419   REF   1                 35,3474    34003 0                    HPL
2420   REF   1                 35,3475    73500 0                    P17.2
2421                           35,3476    77745 1            DLOAD
2422   REF   1                 35,3477    34001 1                    HPE
2423   REF  12  LAST  545      35,3500    36321 1  P17.2     STCALL  HPERMIN
2424   REF   1                 35,3501    74104 1                    S17.2
2425                           35,3502    77414 0            SET     EXIT
2426   REF   9  LAST  548      35,3503    00470 1                    UPDATFLG
2427   REF   2  LAST  455      35,3504   3 3127 0  P17.3     CAF     V06N58      DISPLAY DELTA VTPI , DELTA VTPF , AND H
2428   REF   2  LAST  548      35,3505   0 3517 1            TC      VNCOMP17
2429   REF   2  LAST  473      35,3506   3 3126 1            CAF     V06N55      DISPLAY PERICENTER CODE AND CENTRAL ANG,
2430   REF 120  LAST  534      35,3507   0 4555 0            TC      BANKCALL
2431   REF   5  LAST  516      35,3510     20763 1           CADR    GOFLASHR
2432   REF  17  LAST  521      35,3511   0 4106 1            TC      GOTOPOOH    TERMINATE PROGRAM
2433   REF  18  LAST  548      35,3512   0 4106 1            TC      GOTOPOOH    END PROGRAM
2434   REF   2  LAST  547      35,3513   0 3434 1            TC      P17.1       RECYCLE WITH NEW TTPI OR SEARCH OPTION
2435   REF  29  LAST  504      35,3514   3 4711 1            CAF     TWO         BLANK R2
2436   REF   5  LAST  516      35,3515   0 5415 1            TC      BLANKET
2437   REF  65  LAST  534      35,3516   1 5112 1            TCF     ENDOFJOB
24375  REF  13  LAST  521      E4,1767                       EBANK=  RTRN

2438                           35,3517   0 0006 1  VNCOMP17  EXTEND
2439   REF   4  LAST  472      35,3520   23'766 1            QXCH    QSAVED
2440   REF   6  LAST  521      35,3521   55'765 0            TS      VERBNOUN
2441   REF   7  LAST  548      35,3522   3 1765 1            CA      VERBNOUN
2442   REF 121  LAST  548      35,3523   0 4555 0            TCR     BANKCALL
2443   REF  17  LAST  521      35,3524     20624 0           CADR    GOFLASH
2444                           35,3525   0 3522 1            TC      -3          TERMINATE ILLEGAL REDISPLAY
2445   REF   5  LAST  548      35,3526   0 1766 1            TC      QSAVED      PROCEED
2446   REF 246  LAST  535      35,3527   4 0154 0            CS      MPAC        RECYCLE WITH NEW TPI TIME
24460C5 REF  33  LAST  534      35,3530   6 4705 1            AD      BIT6        OR PROCEED WITH NEW SEARCH OPTION
24461                          35,3531   0 0006 1            EXTEND
244615 REF   3  LAST  548      35,3532   1 3434 0            BZF     P17.1
24462  REF   3  LAST  548      35,3533   0 3522 1            TC      VNCOMP17 +3
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2447                                35,3534   77414 C  ALARUMS  SET    EXIT
2448  REF  10  LAST  548           35,3535   00470 1                  UPDATFLG
2449  REF  25  LAST  454           35,3536   0 5537 C           TC     ALARM
2450                                35,3537   00124 0            OCT    00124          NO SAFE PERCENTER IN THIS SECTOR
2451  REF   2  LAST  454           35,3540   3 4743 C           CAF    V05N09
2452  REF   4  LAST  548           35,3541   0 3517 1           TC     VNCOMP17
2453  REF  19  LAST  548           35,3542   0 4106 1           TC     GOTOPOOH       PROCEED ILLEGAL TERMINATE PROGRAM
2454                                35,3543   01510 1  V06N72   VN     0672
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P0001   RENDEZVOUS NAVIGATION PROGRAM 20
R0002   PROGRAM DESCRIPTION
R0003   MCE NO -1
R0004   MCE BY - N.BRODEUR
R0005   FUNCTIONAL DESCRIPTION
R0006
R0007   TO CONTROL THE CSM ATTITUDE AND OPTICS TO ACQUIRE THE LEM IN THE S+T
R0008   FIELD AND TO POINT THE CSM TRANSPONDER AT THE LEM. TO UPDATE EITHER THE
R0009   LEM OR CSM STATE VECTOR (AS SPECIFIED BY THE ASTRONAUT BY THE DSKY
R0010   ENTRY) ON THE BASIS OF OPTICAL TRACKING DATA (REQUESTED BY DSKY)
R0011   CALLING SEQUENCE -
R0012
R0013   ASTRONAUT REQUEST THROUGH DSKY V37E20E
R0014   SUBROUTINES CALLED-
R0015     R02BOTH (IMU STATUS CHECK)              BANKCALL
R0016     FLAGUP            2PHSCHNG              LOADTIME
R0017     R61CSM  (PREFERRED TRACKING ATTITUDE)   FLAGDOWN
R0018     R52     (AUTO OPTICS POSITIONING ROUT)  SETINTG
R00181    R22     (REND TRACK DATA PROC ROUT)     PRIOCHNG
R0019     ENDOFJOB          INTEGRV               GRP2PC
R0020     INTPRET           MKRLEES               FINDVAC
R0021   NORMAL EXIT MODES-
R0022     P20 MAY BE TERMINATED IN TWO WAYS-ASTRONAUT SELECTION OF ICLING
R0023   PROGRAM (PCO) BY KEYING V37E00E OR BY KEYING IN V56E
R0024   ALARM OR ABORT EXIT MODES-
R0025     NONE DIRECTLY FROM P20
R0026   OUTPUT
R0027     TRKMKCNT = NO OF RENDEZVOUS TRACKING MARKS TAKEN (COUNTER)
R0028     VHFCNT = NO OF VHF RANGING MARKS INCORPORATED (COUNTER)
R0029   FLAGS SET & RESET
R0030     RNDVZFLG,VEHUPFLG,UPDATFLG,TRACKFLG,TARGIFLG
R0031     RCLCFLAG,WBODY,WBODY1,WBODY2,DELCDUX,DELCDUY,DELCDUZ
R0032     STIKFLAG,PRFTRKAT,VINTFLAG,DIMOFLAG,R60FLAG,R61CNTR
 0033                        33,3773                 BANK    33
 0034   REF   2  LAST  448  37,2000                 SETLOC  P20S
 0035                        37,2207                 BANK

 0036   REF   4  LAST  205  E6,1412                 EBANK=  ESTRCKER
 0037   REF   1                                     COUNT*  $$/P20

 0038   REF 122  LAST  548  37,2207  0 4555 C  P20G20  TC    BANKCALL
 0039   REF   1             37,2210   17573 0         CADR  R02BOTH     IMU STATUS CHECK
A0040                                                        BLOCKING OF UPLINK IS DONE BY UPLINK PRG
 0041   REF 115  LAST  534  37,2211  3 4714 1          CAF   ZERO
 0042   REF   3  LAST  179  37,2212  55'126 1          TS    TRKMKCNT    ZERO REND TRACKING MARK COUNTER
 0043   REF   5  LAST  502  37,2213  55'125 1          TS    VHFCNT      ZERO REND VHF RNG MRK COUNTER
 0044   REF  19  LAST  501  37,2214  0 5435 C          TC    UPFLAG      SET PREF TRACK ATT FLAG
 0045   REF   3  LAST  257  37,2215   00120 1          ADRES PRFTRKAT    BIT 10  FLAG 5
 0046   REF  22  LAST  442  37,2216  0 5447 C          TC    DOWNFLAG    LEM TO BE UPDATED.  VEHUPFLG RESET.
 0047   REF   3  LAST  253  37,2217   00026 C          ADRES VEHUPFLG    BIT 8  FLAG 1
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0050  REF  20  LAST  550   37,2220  0 5435 C          TC      UPFLAG      SET TRACKFLAG
0051  REF   3  LAST  500   37,2221   00031 C          ADRES   TRACKFLG    BIT 5  FLAG 1
0052  REF  21  LAST  551   37,2222  0 5435 C          TC      UPFLAG      SET UPDATFLG
0053  REF  11  LAST  549   37,2223   00027 1          ADRES   UPDATFLG    BIT 7  FLAG 1
0054  REF  22  LAST  551   37,2224  0 5435 C          TC      UPFLAG      SET RNDVZFLG
0055  REF   2  LAST  252   37,2225   00010 C          ADRES   RNDVZFLG    BIT 7  FLAG 0
0056  REF   5  LAST  528   37,2226  0 5261 1          TC      2PHSCHNG
0057                       37,2227   00004 C          OCT     00004
0058                       37,2230   05022 1          OCT     05022
0059                       37,2231   26000 C          OCT     26000
0060  REF  74  LAST  548   37,2232  0 6006 1          TC      INTPRET
0061                       37,2233   77634 C          RTB
0062  REF  10  LAST  519   37,2234   45505 C                  LOADTIME
0063  REF   2  LAST   77   37,2235   35225 1          STCALL  MARKTIME
0064  REF   1              37,2236   56343 C                  SETINTG     SET INTEGRATION FLAGS
0065                       37,2237   43014 C          BOFF    SET
0066  REF   2  LAST  203   37,2240   02756 1                  RENDWFLG
0067  REF   1              37,2241   76243 C                  P20.1
0068  REF   3  LAST  203   37,2242   01476 C                  DIMOFLAG    SET TO INTEGRATE THE W MATRIX
0069                       37,2243   43014 C  P20.1    BON     CLEAR
0070  REF   4  LAST  550   37,2244   00707 1                  VEHUPFLG
0071  REF   1              37,2245   76247 1                  P20.2
0072  REF   4  LAST  203   37,2246   01674 C                  VINTFLAG    SET FOR LM INTEGRATION
0073                       37,2247   77624 1  P20.2    CALL
0074  REF   3  LAST  203   37,2250   27113 1                  INTEGRV
0075                       37,2251   77624 1          CALL
0076  REF   1              37,2252   56712 C                  GRP2PC      GROUP 2 PHASE CHANGE
0077                       37,2253   77624 1          CALL
0078  REF   2  LAST  551   37,2254   56343 C                  SETINTG     SET INTEGRATION FLAGS
0079                       37,2255   43014 C          BOFF    CLEAR
0080  REF   5  LAST  551   37,2256   00747 C                  VEHUPFLG
0081  REF   1              37,2257   76261 C                  P20.3
0082  REF   5  LAST  551   37,2260   01674 C                  VINTFLAG    SET FOR LM INTEGRATION
0083                       37,2261   77624 1  P20.3    CALL
0084  REF   4  LAST  551   37,2262   27113 1                  INTEGRV
0085                       37,2263   77776 1          EXIT
0086  REF   2  LAST  408   37,2264  3 7663 C          CAF     PRIO26
0088  REF  21  LAST  529   37,2265  0 5042 1          TC      FINDVAC
0089  REF   7  LAST  502   E7,1734                     EBANK=  MRKBUF2
0090  REF   2  LAST  206   37,2266   02512 C          2CADR   R22
0090                       37,2267   70067 1
0092  REF   6  LAST  551   37,2270  0 5261 1          TC      2PHSCHNG
0093                       37,2271   00072 1          OCT     00072
0094                       37,2272   00111 C          OCT     00111
0095  REF   2  LAST  383   37,2273  3 4761 C  PIKUP20  CAF     PRIO14      ALLOW HIGHER PRIO THAN LAMBERT
0096  REF   7  LAST  438   37,2274  0 5103 C          TC      PRIOCHNG
0097  REF  29  LAST  509   37,2275  3 4706 1          CAF     BIT5        IS TRACK FLAG SET
0098  REF  33  LAST  223   37,2276  7 0075 1          MASK    STATE +1
0099                       37,2277  0 0006 1          EXTEND
0100  REF  66  LAST  548   37,2300  1 5112 1          BZF     ENDOFJOB    NO
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0101  REF  18  LAST  334  37,2301  3 4676 1          CAF     BIT13
0102  REF  34  LAST  551  37,2302  7 0077 0          MASK    STATE +3          IS REFSMFLG SET
0103                       37,2303  0 0006 1          EXTEND
0104  REF  67  LAST  551  37,2304  1 5112 1          BZF     ENDOFJOB
0107  REF 116  LAST  550  37,2305  3 4714 1          CAF     ZERO
0108  REF   2  LAST  113  37,2306  55'775 1          TS      R61CNTR           INITIALIZE R61 COUNTER
0111  REF  23  LAST  551  37,2307  0 5435 0          TC      UPFLAG            SET R60FLAG
0112  REF   1                    37,2310   00126 1    ADRES   R60FLAG           BIT 4  FLAG 5
0113  REF 123  LAST  550  37,2311  0 4555 0          TC      BANKCALL
0114  REF   1                    37,2312   76536 0    CADR    R61CSM
0115  REF  23  LAST  550  37,2313  0 5447 0          TC      DOWNFLAG          RESET R60FLAG
0116  REF   2  LAST  552  37,2314   00126 1    ADRES   R60FLAG           BIT 4  FLAG 5
0117  REF   2  LAST   97  E5,1777               EBANK=  QMIN
0118  REF   2  LAST  235  37,2315  3 4751 0          CAF     EBANK5
0119  REF  24  LAST  527  37,2316  54 003 0          TS      EBANK
01191 REF  24  LAST  552  37,2317  0 5435 0          TC      UPFLAG            SET TARGET FLAG TO LEM
01192 REF   2  LAST  382  37,2320.  00024 1    ADRES   TARG1FLG          BIT 10  FLAG 1
0120  REF  75  LAST  551  37,2321  0 6006 1  P20R52J8 TC      INTPRET
0121                       37,2322   77624 1    CALL
0122  REF   1              37,2323   30002 0               R52               SET UP AUTO OPTICS JOB
0123                       37,2324   77776 1    EXIT
0124  REF 124  LAST  552  37,2325  0 4555 0          TC      BANKCALL
0125  REF   1              37,2326   16070 1    CADR    MKRLEES
0126  REF  66  LAST  528  37,2327  3 4712 1          CAF     ONE               HOLD PRESENT ATTITUDE
0127  REF   4  LAST  407  37,2330  55'332 0          TS      HOLDFLAG
0128  REF  68  LAST  552  37,2331  0 5112 0          TC      ENDOFJOB
0129                       37,2332   00203 0  OCT203   OCT     00203
0130  REF   1                7707             FIRST3   EQUALS FURST3
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L P20-P25 USER'S PAGE NO. 4 E5 S3

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P0131   ORBITAL NAVIGATION PROGRAM 22
 0132                          31,2021                 BANK    31
 0133   REF    1               30,2000                 SETLOC  P20S1
 0134                          30,2000                 BANK

 0135   REF   12  LAST  274    E5,1751                 EBANK=  LANDMARK
 0136   REF    1                                      COUNT*  $$/P22

 0139   REF   24  LAST  552    30,2000   0 5447 C  PROG22  TC      DOWNFLAG        RESET RNDVZFLG  BIT 7  FLAG 0
 01394  REF    3  LAST  551    30,2001    00010 C          ADRES   RNDVZFLG
 01396  REF  125  LAST  552    30,2002   0 4555 C          TC      BANKCALL
 0140   REF    2  LAST  550    30,2003    17573 0          CADR    R02BOTH         IMU STATUS CHECK
 0141   REF   76  LAST  552    30,2004   0 6006 1          TC      INTPRET         COMPUTE ANGLE BETWEEN Y AND VXR SM
 0142                          30,2005    77634 0          RTB
 0143   REF   11  LAST  551    30,2006    45505 0                  LOADTIME
 0145   REF   26  LAST  543    30,2007    34041 0          STCALL  TDEC1
 0146   REF    3  LAST  543    30,2010    27045 0                  CSMCONIC        INTEGRATE TO PRESENT TIME
 0147                          30,2011    47375 0          VLOAD   VXV             CROSS PRODUCT BETWEEN V AND R
 0148   REF   13  LAST  543    30,2012    00007 0                  VATT
 0149   REF   17  LAST  543    30,2013    00001 0                  RATT
 0150                          30,2014    50256 0          UNIT    DOT
 0151   REF   13  LAST  527    30,2015    01744 1                  REFSMMAT +6
 0152                          30,2016    77646 0          ABS
 0153                          30,2017    65552 0          SL1     ARCCOS
 0154   REF    7  LAST  483    30,2020    03626 0          STORE   +MGA
 0155                          30,2021    77414 0          CLEAR   EXIT
 0156   REF    3  LAST  551    30,2022    02676 1                  RENDWFLG
 0157   REF    1               30,2023   3 2162 0          CAF     V06N45B
 0158   REF  126  LAST  553    30,2024   0 4555 0          TC      BANKCALL
 0159   REF    6  LAST  548    30,2025    20763 1          CADR    GOFLASHR
 0160   REF   20  LAST  549    30,2026   0 4106 1          TC      GOTOPOOH        TERM P22
 0161   REF    1               30,2027   0 2034 1          TC      PROG22A         PROC
 0162                          30,2030   0 2023 1          TC      -5              ENTER
 0163   REF   17  LAST  515    30,2031   3 6214 0          CAF     THREE
 0164   REF    6  LAST  548    30,2032   0 5415 1          TC      BLANKET         BLANK OUT R1 + R2
 0165   REF   69  LAST  552    30,2033   0 5112 0          TC      ENDOFJOB
 0166   REF    1               30,2034   4 2172 0  PROG22A CS      OCTL7000        SET OFFSET NO.=0
 01661  REF   13  LAST  553    30,2035   7 1751 1          MASK    LANDMARK
 01662  REF   14  LAST  553    30,2036   55*751 1          TS      LANDMARK
 01663  REF   77  LAST  553    30,2037   0 6006 1          TC      INTPRET
 01664                          30,2040    77614 1          CLEAR
 01665  REF    1               30,2041    01664 1                  P22MKFLG
 0167                          30,2042    43014 0          SET     BOFF
 0168   REF    3  LAST  526    30,2043    00462 1                  ERADFLAG
 0169   REF    6  LAST  502    30,2044    04343 1                  CMOONFLG
 0170   REF    1               30,2045    60107 1                  PROG22B         EARTH
 0171                          30,2046    77614 1          SET                     MOON
 0172   REF    3  LAST  449    30,2047    01463 1                  LUNAFLAG
 0174                          30,2050    77776 1          EXIT
 0178   REF    1               30,2051   3 2163 1          CAF     V05N7022
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0179  REF 127  LAST 553   30,2052  0 4555 0          TC     BANKCALL
0180  REF   7  LAST 553   30,2053   20763 1          CADR   GOFLASHR
0181  REF  21  LAST 553   30,2054  0 4106 1          TC     GOTOPOOH      TERMINATE
0182                       30,2055  0 2062 1          TC     +5            PROCEED   UNPACK ABCDE
0183                       30,2056  0 2051 1          TC     -5            RECYCLE
0184  REF   9  LAST 515   30,2057  3 4715 0          CAF    FIVE          IMMEDIATE RETURN BLANK OUT R1,R2
0185  REF   7  LAST 553   30,2060  0 5415 1          TC     BLANKET
0186  REF  7C  LAST 553   30,2061  0 5112 0          TC     ENDOFJOB
0187  REF  78  LAST 553   30,2062  0 6006 1          TC     INTPRET
0188                       30,2063   77624 1          CALL                 UNPACK ABCDE FROM LANDMARK
0189  REF   1              30,2064   60234 1                               UNPACKAE
0190                       30,2065   45335 0          SLOAD  DSU
0191  REF   2  LAST  94    30,2066   02745 0                               22SUBSCL
0192  REF   1              30,2067   20166 1                               P22MAXDE
0193                       30,2070   45044 0          BPL    CALL
0194  REF   1              30,2071   60075 0                               DE-GR-50      DE GREATER THAN MAX
0195  REF   1              30,2072   76333 0                               P22SUBRA      SUBROUTINE A SETS LAT/LONG/ALT
0196                       30,2073   77650 1          GOTO
0197  REF   1              30,2074   60114 0                               CALLR52
0198                       30,2075   77624 1  DE-GR-50 CALL                 CALL ADVANCED ORBIT ROUTINE
0199  REF   1              30,2076   30206 0                               ADVORB
01991                      30,2077   77776 1          EXIT
01992 REF   7  LAST 551    30,2100  0 5261 1          TC     2PHSCHNG
01993                      30,2101   00004 0          OCT    00004
01994                      30,2102   05022 1          OCT    05022
01995                      30,2103   13000 0          OCT    13000
01996 REF  79  LAST 554    30,2104  0 6006 1          TC     INTPRET
0200                       30,2105   77650 1          GOTO
0201  REF   1              30,2106   60132 1                               DOV5N71
0202                       30,2107   43014 0  PROG22B  CLEAR  SET           EARTH ORBIT
0203  REF   4  LAST 553    30,2110   01663 0                               LUNAFLAG
0204  REF   2  LAST  55    30,2111   03067 0                               KNOWNFLG
0205                       30,2112   77624 1          CALL                 GET LAT/LONG/ALT FROM ASTRO
0206  REF   1              30,2113   60217 0                               P22SUBRB
0207                       30,2114   77776 1  CALLR52  EXIT
0208  REF  25  LAST 552    30,2115  0 5435 0          TC     UPFLAG        TARG2FLG = 1 = SIGHTING LANDMARK
0209  REF   1              30,2116   00025 0          ADRES  TARG2FLG      BIT 9  FLAG 1
0210  REF  25  LAST 553    30,2117  0 5447 0          TC     DOWNFLAG      TARG1FLG = 0 = NON-LEM
0211  REF   3  LAST 552    30,2120   00024 1          ADRES  TARG1FLG      BIT 10  FLAG 1
02111 REF   8  LAST 554    30,2121  0 5261 1          TC     2PHSCHNG
02112                      30,2122   00004 0          OCT    00004
02113                      30,2123   05022 1          OCT    05022
02114                      30,2124   13000 0          OCT    13000
0212  REF  10  LAST 554    30,2125  3 4715 0          CAF    FIVE
0213  REF   3  LAST 201    30,2126   54 301 1          TS     MARKINDX      SET MARK INDEX=5 FOR R52
0217  REF  60  LAST 554    30,2127  0 6006 1          TC     INTPRET
0218                       30,2130   77624 1          CALL
0219  REF   2  LAST 552    30,2131   30002 0                               R52
0220                       30,2132   77776 1  DOV5N71  EXIT
0221  REF   1              30,2133  3 2164 0          CAF    V05N7122
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0222   REF 128  LAST  554   30,2134  0 4555 C            TC      BANKCALL
0223   REF   8  LAST  554   30,2135    20763 1           CADR    GOFLASHR
0224   REF  22  LAST  554   30,2136  0 4106 1            TC      GOTOPOOH        TERMINATE
0225                        30,2137  0 2144 1            TC      +5              PROCEED    UNPACK ABCDE
0226                        30,2140  0 2133 1            TC      -5              RECYCLE
0227   REF  11  LAST  554   30,2141  3 4715 C            CAF     FIVE            IMMEDIATE ENTRY BLANK CUT R1,R3
0228   REF   8  LAST  554   30,2142  0 5415 1            TC      BLANKET
0229   REF  71  LAST  554   30,2143  0 5112 C            TC      ENDOFJOB
0230   REF  81  LAST  554   30,2144  0 6006 1            TC      INTPRET
0231                        30,2145    77624 1           CALL
0232   REF   2  LAST  554   30,2146    60234 1                   UNPACKAE
0233                        30,2147    77624 1           CALL                    SET LAT/LONG/ALT
0234   REF   2  LAST  554   30,2150    76333 C                   P22SUBRA
0235                        30,2151    66744 C  PROG22C  LXC,2   SLOAD*
0236   REF  29  LAST  445   30,2152    01330 C                   MARKSTAT
0237   REF  11  LAST  502   30,2153    77724 C                   QPRET,2
0238   REF   3  LAST  174   30,2154    36750 C           STCALL  8NN
0240   REF   1              30,2155    60255 C                   S22.1           ESTABLISH LANDMARK - COMPUTE ORBITAL
0241                        30,2156    77776 1  P22OVER  EXIT
02411  REF  27  LAST  534   30,2157  0 5301 C            TC      PHASCHNG
02412                       30,2160    04022 C            OCT     04022
0242   REF   2  LAST  553   30,2161  0 2034 1            TC      PROG22A         POINT A ON GSOP
0243                        30,2162    01455 1  V06N45B  VN      0645
0244                        30,2163    01306 C  V05N7022  VN      00570
0245                        30,2164    01307 1  V05N7122  VN      00571
0246                        30,2165    00041 1  P22MAXDE  2DEC    33 B-14
0246                        30,2166    00000 1
0247                        30,2167    01531 1  V06N89    VN      00689
0248                        30,2170    00077 1  OCTL77    OCT     77              DE MASK OF ABCDE
0249                        30,2171    00700 C  OCTL700   OCT     700              C MASK OF ABCDE
0250                        30,2172    07000 C  OCTL7000  OCT     7000             B MASK OF ABCDE
02505  REF   3  LAST  550   37,2000                      SETLOC  P20S
02506                       37,2333                      BANK

0251                        37,2333    43020 1  P22SUBRA STQ     BOFF            SET LAT/LONG/ALT FOR KNOWN LANDMARK
0252   REF   2  LAST  122   37,2334    03667 C                   S22TOFF
0253   REF   3  LAST  554   37,2335    03347 1                   KNOWNFLG
0254   REF   3  LAST  555   37,2336    03667 C                   S22TOFF         UNKNOWN LANKMARK,EXIT
0255                        37,2337    46135 1           SLOAD   BHIZ
0256   REF   3  LAST  554   37,2340    02745 C                   22SUBSCL
0257   REF   1              37,2341    60213 1                   OBTAINLL        GET LAT/LONG/ALT FROM ASTRO
0258                        37,2342    50025 C           DSU     BMN
0259   REF   1              37,2343    21646 C                   9DWIC           2 B-14
0260   REF   1              37,2344    60173 1                   S22LSITE        GET LAT/LONG/ALT FROM RLS (LANDING SITE)
0261                        37,2345    70152 C           SLI     LXC,1           GET LAT/LONG/ALT FROM TABLES
0262   REF 247  LAST  548   37,2346    00154 1                   MPAC
0263                        37,2347    70601 1           SETPD   DLOAD*
0264                        37,2350    00001 C                   OD
0265   REF   1              37,2351    23705 1                   ALTTAB,1
0266                        37,2352    64723 C           PDDL*   PDDL*
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0267   REF   1                  37,2353   23623 1                LONGTAB,1
0268   REF   1                  37,2354   23541 0                LATTAB,1
0269                            37,2355   77666 1          VDEF
0270   REF   7  LAST  526       37,2356   35104 1          STCALL LAT
0271   REF   4  LAST  555       37,2357   03667 0                 S22TOFF          EXIT
02715  REF   2  LAST  553       30,2000             SETLOC P20S1
02716                           30,2173             BANK

0272                            30,2173   77634 0  S22LSITE RTB                    CONVERT RLS FROM MOON-FIXED TO BASIC REF
0273   REF  12  LAST  553       30,2174   45505 0                 LOADTIME
02731                           30,2175   24007 0          STOVL  6D               6-7D= TIME
02732  REF   5  LAST  508       30,2176   02026 1                 RLS
02733                           30,2177   14001 0          STODL  0D               0-5D= LANDING SITE VECTOR
02734  REF   4  LAST  438       30,2200   15330 0                 HIDPHALF         MPAC= ANY NON-ZERO FOR MOON
02735                           30,2201   77624 1          CALL
02736  REF   1                  30,2202   55341 1                 RP-TO-R          RLS IN BASIC REF B-27 IN MPAC
02737                           30,2203   77742 0          VSR2                    LUNAFLAG AND ERADFLAG SET ABOVE
0274   REF   3  LAST  449       30,2204   02152 0          STORE  ALPHAV           SCALE RLS B-29 FOR LAT-LONG
0275                            30,2205   77634 0          RTB
0276   REF  13  LAST  556       30,2206   45505 0                 LOADTIME         SET PRESENT TIME IN MPAC FOR LAT-LONG
0277                            30,2207   77624 1          CALL
0278   REF   2  LAST  449       30,2210   26322 0                 LAT-LONG
0279                            30,2211   77650 1          GOTO
0280   REF   5  LAST  556       30,2212   03667 0                 S22TOFF          EXIT
0281                            30,2213   77624 1  OBTAINLL CALL                   GET LAT/LONG/ALT FROM ASTRO
0282   REF   2  LAST  554       30,2214   60217 0                 P22SUBRB
0283                            30,2215   77650 1          GOTO
0284   REF   6  LAST  556       30,2216   03667 0                 S22TOFF          EXIT
0285                            30,2217   77420 1  P22SUBRB STQ   EXIT             GET LAT/LONG/ALT FROM ASTRO
0286   REF   7  LAST  556       30,2220   03670 0                 S22TOFF +1
0287   REF   1                  30,2221  3 3656 1          CAF    V06N89B
0288   REF 129  LAST  555       30,2222  0 4555 0          TC     BANKCALL
0289   REF  18  LAST  548       30,2223   20624 0          CADR   GOFLASH
0290   REF  23  LAST  555       30,2224  0 4106 1          TC     GOTOPOOH         TERMINATE
0291                            30,2225  0 2227 1          TC     +2               PROCEED
0292                            30,2226  0 2221 1          TC     -5               ENTER OR RECYCLE
0293   REF  82  LAST  555       30,2227  0 6006 1          TC     INTPRET
0294                            30,2230   77624 1          CALL
0295   REF   1                  30,2231   61345 1                 LLASRDA
0296                            30,2232   77650 1          GOTO
0297   REF   8  LAST  556       30,2233   03670 0                 S22TOFF +1       EXIT
0298                            30,2234   77776 1  UNPACKAE EXIT                   UNPACK LANDMARK INTO ABCDE
0299   REF  15  LAST  553       30,2235  3 1751 0          CA     LANDMARK
0300   REF   1                  30,2236  7 2170 1          MASK   OCTL77
0301   REF   4  LAST  555       30,2237  55'744 0          TS     22SUBSCL         DE=L=LMK ID NO. N  00,01, 02-26
0302   REF  16  LAST  556       30,2240  3 1751 0          CA     LANDMARK
0303   REF   2  LAST  553       30,2241  7 2172 0          MASK   OCTL7000
0304   REF   2  LAST   94       30,2242  55'745 1          TS     CXOFF            B= OFFSET INDICATOR
0305   REF  26  LAST  554       30,2243  0 5435 0          TC     UPFLAG           SET KNOWNFLG
0306   REF   4  LAST  555       30,2244   00141 0          ADRES  KNOWNFLG         BIT 8  FLAG 6
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0307   REF  17  LAST  556   30,2245  3 1751 0    CA      LANDMARK
0308   REF  36  LAST  415   30,2246  7 4675 0    MASK    BIT14      IF BIT14 OF LANDMARK=1,A=2 OTHERWISE A=1
0309                        30,2247  0 0006 1    EXTEND
0310                        30,2250  1 2253 0    BZF     +3         A=1 LEAVE KNOWNFLAG SET FOR KNOWN LMK
0311   REF  26  LAST  554   30,2251  0 5447 0    TC      DOWNFLAG   A=2 CLEAR KNOWNFLG  (BIT 8  FLAG 6) FOR
0312   REF   5  LAST  556   30,2252   00141 0    ADRES   KNOWNFLG       UNKNOWN LMK
0313   REF  83  LAST  556   30,2253  0 6006 1    TC      INTPRET
0314                        30,2254   77616 0    RVQ
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R0315   PROGRAM NAME- OPTICS CALIBRATION ROUTINE
R0316   MOD NO- 1
R0317   MOD BY- TOM KNATT
R0318
R0319   FUNCTIONAL DESCRIPTION- TO MEASURE THE EFFECT OF SOLAR RADIATION ON
R0320     THE SXT TRUNNION ANGLE AND TO STORE THE MEASURED TRUNNION BIAS FOR P23
R0321
R0322   CALLING SEQUENCE- CALL
R0323                           R57
R0324
R0325   SUBROUTINES CALLED- DISPLAY ROUTINES
R0326
R0327   NORMAL EXIT MODES-VIA EGRESS
R0328
R0329   ALARMS- NONE
R0330
R0331   ABORT MODES- P23ABORT IF MARKING SYSTEM OR EXTENDED VERB ACTIVE
R0332   INPUT- NONE REQUIRED, NORMALLY CALLED BY P23
R0333   OUTPUT- TRUNNION BIAS ANGLE- ANGLE DETERMINED WHEN SHAFT LINE OF SIGHT
R03332  (SLOS) AND LANDMARK LINE OF SIGHT (LLOS) ARE SUPERIMPOSED. THIS ANGLE
R03334  MAY NOT BE EXACTLY ZERO BECAUSE OF UNEVEN HEATING OF THE OPTICS,FOR
R03336  EXAMPLE.
R0334
R0335   ERASABLE INITIALIZATION REQUIRED- MRKBUF1, EXTVBACT
R0336
R0337   DEBRIS- RUPTREGS USED BY MARKBUPT AND ERASABLES USED BY DISPLAYS
 0338                          33,3773                 BANK    33
 0339   REF   4  LAST  555    37,2000                 SETLOC  P20S
 0340                          37,2360                 BANK
 0341   REF   1                                       COUNT*  $$/R57
 0342   REF  20  LAST  275    E7,1725                 EBANK=  MRKBUF1
 0343                          37,2360   77420 1  R57  STQ     EXIT
 0344   REF   2  LAST   87     37,2361   02317 0       EGRESS
 03442  REF   3  LAST  432    37,2362   3 4753 1      CAF     EBANK7
 03444  REF  25  LAST  552    37,2363   54 003 0      TS      EBANK
 0345   REF  19  LAST  516    37,2364   3 6211 0      CAF     SIX       BIT2 = MARKING SYSTEM IN USE
 0346   REF  16  LAST  509    37,2365   7 1044 1      MASK    EXTVBACT  BIT3 = EXTENDED VERB IN PROGRESS
 0347   REF 141  LAST  528    37,2366   10 000 0      CCS     A
 0348   REF   1                37,2367   0 2437 0      TC      P23ABRT   SET, THEREFORE ABORT
 0349   REF  23  LAST  507    37,2370   3 4711 1      CAF     BIT2      NOT SET
 0350   REF  17  LAST  558    37,2371   27'044 1      ADS     EXTVBACT  SET IT
 0351   REF  27  LAST  556    37,2372   0 5435 0  R57A TC      UPFLAG    SET V59FLAG (BIT 12  FLAG 5) TO INDICATE
 0352   REF   1                37,2373    00116 1      ADRES   V59FLAG   CALIBRATION MARK
 0353   REF   1                37,2374   3 2442 1      CAF     V59NB
 0354   REF 130  LAST  556    37,2375   0 4555 0      TC      BANKCALL
 0355   REF   1                37,2376    20504 1      CADR    GOMARKFR
 0356   REF  24  LAST  556    37,2377   0 4106 1      TC      GOTOPOOH  TERMINATE
 0357   REF   1                37,2400   0 2424 1      TC      ENDR57
 0358   REF   2  LAST  558    37,2401   0 2424 1      TC      ENDR57
 0359   REF  10  LAST  366    37,2402   3 4716 0      CAF     SEVEN
```

```
0360   REF   9  LAST  555   37,2403   0 5415 1          TC      BLANKET     BLANK OUT R1,R2,R3
0361   REF  72  LAST  555   37,2404   0 5112 C          TC      ENDOFJOB
R0362  STORE TRUNNION ANGLE (OCDU)
0363   REF   1               37,2405   3 2441 1 MARKDISP CAF     V06N87NB
0364   REF 131  LAST  558   37,2406   0 4555 C          TC      BANKCALL
0365   REF   2  LAST  558   37,2407    20504 1          CADR    GOMARKFR
0366   REF  25  LAST  558   37,2410   0 4106 1          TC      GOTOPOOH    TERMINATE
0367   REF   1               37,2411   0 2416 C          TC      R57B        PROCEED
0368   REF   1               37,2412   0 2372 C          TC      R57A        ENTER (RECYCLE)
0369   REF  12  LAST  555   37,2413   3 4715 C          CAF     FIVE
0370   REF  10  LAST  559   37,2414   0 5415 1          TC      BLANKET     BLANK OUT R1,R3
0371   REF  73  LAST  559   37,2415   0 5112 C          TC      ENDOFJOB
03712  REF   1               37,2416   3 2444 1 R57B     CA      19.77DEG    PUT FIXED INTO ERASABLE FOR MSU
03714  REF  61  LAST  531   37,2417   54 001 1          TS      L           INSTRUCTION COMING UP
0372   REF  21  LAST  558   37,2420   3 1732 C          CA      MRKBLF1 +5  CONTAINS TRUNNION
037245                       37,2421   0 0006 1          EXTEND
03725  REF  62  LAST  559   37,2422   20 001 1          MSU     L           CORRECTS TRUNBIAS FROM 2'S TO 1'S
0373   REF   1               37,2423   55'342 1          TS      TRUNBIAS
0376   REF  27  LAST  557   37,2424   0 5447 C ENDR57   TC      DOWNFLAG    RESET V59FLAG
0377   REF   2  LAST  558   37,2425    00116 1          ADRES   V59FLAG     BIT 12  FLAG 5
03772  REF   3  LAST  552   37,2426   3 4751 C          CAF     EBANK5
03774  REF  26  LAST  558   37,2427   54 003 C          TS      EBANK
03776  REF   3  LAST  551   37,2430   3 4761 C          CAF     PRIO14
03777  REF  16  LAST  507   37,2431   0 5027 1          TC      NOVAC       THIS JOB CLEARS BIT IN
03778  REF  30  LAST  555      1330                     EBANK=  MARKSTAT
037785 REF   2  LAST  226   37,2432    05423 1          2CADR   ENDMARK      MARKING  IN R57 SO R53 CAN TAKE OVER
037785                       37,2433    04062 1
0378   REF  84  LAST  557   37,2434   0 6006 1          TC      INTPRET
0379                         37,2435    77650 1          GOTO
0380   REF   3  LAST  558   37,2436    02317 C                   EGRESS
0381   REF   3  LAST  216   37,2437   0 5604 C P23ABRT  TC      BAILOUT
0382                         37,2440    01211 1          OCT     01211
0383                         37,2441    01527 C V06N87NB VN      0687
0384                         37,2442    16600 C V59NB    VN      5900
0385                         37,2443    14600 1 V51NB    VN      5100
03852                        37,2444    61740 C 19.77DEG OCT     61740
```

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P0386   PROGRAM DESCRIPTION
R0387   MCC NO - 1
R0388   MCC BY - N.BROCEUR
R0389   FUNCTIONAL DESCRIPTION
R0390
R0391     TO PERFORM SIGHTING MARKS IN CONJUNCTION WITH THE RENDEZVOUS NAVIG-
R0392   ATION PROGRAM. CALLED BY ASTRONAUT VIA EXTENDED VERB
R0394   CALLING SEQUENCE -
R0395           R21 VIA V 57
R0396           R23 VIA V 54
R0399   SUBROUTINES CALLED -
R0400     FLAGUP        FLAGDOWN        BANKCALL
R0401     ENDOFJOB      GOMARK2         GOMARKF
R04011    INTPRET       GENTRAN         KLEENEX
R04012    ENDMARK
R0402   NORMAL EXIT MODES-
R0403     MARKBUPT USED BY SXTMARK HAS BEEN MODIFIED TO STORE MARK IN MRKBUF2
R0404   FOR USE BY R22. WHEN ASTRONAUT IS FINISHED TAKING MARKS, HE HITS AN
R0405   PROCEED ,  R21 IS TERMINATED THUS CAUSING THE FINAL MARK TO BE TRANSFRD
R04051  TO MRKBUF2 FOR PROCESSING BY R22
R0406   ALARM OR ABORT EXIT MODES -
R0407     NONE
R0408   OUTPUT -
R0409     7 REGISTER MRKBUF2 CONTAINING TIME2,TIME1,COSY,OPTICS X,COSZ,OPTICS Y,
R0410   COSX.
R0411   ERASABLE INITIALIZATION REQUIRED
R0412   FLAGS SET AND RESET
R0413     R21MARK   (COMMUNICATION TO MARKRUPT TO STORE MARKS IN MRKBUF1 + 2)
R0414     R23FLG  INDICATES COAS MARKING
R0415   DEBRIS
 0416   REF  22  LAST  559    E7,1725                    EBANK= MRKBUF1
 0417   REF   1               37,2000                    SETLOC RENDEZ
 0418                         37,2445                    BANK

 0419   REF   1                                          COUNT* $$/R21

 0420   REF  28  LAST  558    37,2445  0 5435 0  R21CSM  TC     UPFLAG      SET R21MARK
 0421   REF   2  LAST  194    37,2446   00037 0          ADRES  R21MARK     BIT 14  FLAG 2
 0422   REF  12  LAST  502    37,2447  3 7716 0  R23CSM  CA     NEGONE
 0423   REF  23  LAST  560    37,2450  55'725 1          TS     MRKBUF1
 0424   REF   8  LAST  551    37,2451  55'734 1          TS     MRKBUF2
 0427   REF  12  LAST  444    37,2452  3 0075 0          CA     FLAGWRD1
 0428   REF  19  LAST  537    37,2453  7 4702 1          MASK   BIT9        TEST R23FLG
 0429                         37,2454  0 0006 1          EXTEND
 0430   REF   1               37,2455  1 2510 0          BZF    R21C1       NOT SET REGULAR R21 MARKING
 0431   REF   1               37,2456  3 2535 0          CAF    V0694       R23 BACKUP MARKING
 0432   REF 132  LAST  559    37,2457  0 4555 0          TC     BANKCALL    DISPLAY SHAFT + TRUNNION
 0433   REF   5  LAST  494    37,2460   20465 1          CADR   GOMARKF
 0434   REF   1               37,2461  0 2527 0          TC     R21END      TERM
 0435                         37,2462  0 2464 0          TC     +2          PROC
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0436                                37,2463  0 2456 1           TC      -5                 ENTER
0437  REF   1                      37,2464  3 2534 1  R23CSM1  CAF     V53                PERFORM ALT LOS SIGHT MARK
0438  REF 133  LAST  560           37,2465  0 4555 C           TC      BANKCALL
0439  REF   1                      37,2466   20470 C           CADR    GOMARK2
0440  REF   2  LAST  560           37,2467  0 2527 C           TC      R21END             V34-TERMINATE R23
0441  REF   1                      37,2470  1 2516 C           TCF     R21CSMA            PROCEED-END BACK UP MARKING (R23)
0442  REF  20  LAST  558           37,2471  3 6211 C           CAF     SIX                TRANSFER MRKBUF1 TO MRKBUF2
0443  REF   7  LAST  259           37,2472  0 5475 1           TC      GENTRAN
0444  REF  24  LAST  560           37,2473   01725 C           ADRES   MRKBUF1
0445  REF   9  LAST  560           37,2474   01734 C           ADRES   MRKBUF2
0451                                37,2475  0 0006 1           EXTEND
0452  REF  17  LAST  530           37,2476  3 0025 C           DCA     TIME2
0453  REF  25  LAST  561           37,2477  53'726 1           DXCH    MRKBUF1            READ TIME
0454  REF   4  LAST  526           37,2500  3 0033 1           CA      CDUY               READ CDU ANGLES
0455  REF  26  LAST  561           37,2501  55'727 C           TS      MRKBUF1 +2
0456  REF   8  LAST  526           37,2502  3 0034 C           CA      CDUZ
0457  REF  27  LAST  561           37,2503  55'731 1           TS      MRKBUF1 +4
0458  REF  11  LAST  526           37,2504  3 0032 C           CA      CDUX
0459  REF  28  LAST  561           37,2505  55'733 C           TS      MRKBUF1 +6
0464                                37,2506  0 0003 1           RELINT
0465  REF   1                      37,2507  0 2464 C           TC      R23CSM1
0466  REF   1                      37,2510  3 2443 C  R21C1    CAF     V51NB
0467  REF 134  LAST  561           37,2511  0 4555 C           TC      BANKCALL
0468  REF   2  LAST  561           37,2512   20470 C           CADR    GOMARK2
0469  REF   3  LAST  561           37,2513  0 2527 C           TC      R21END             V34-TERMINATE R21
0470  REF   2  LAST  561           37,2514  1 2516 C           TCF     R21CSMA            PROCEED-END R21
0471  REF   2  LAST  560           37,2515  1 2510 C           TCF     R21C1              RECYCLE

0473  REF  29  LAST  561           37,2516  3 1725 C  R21CSMA  CA      MRKBUF1            IF -1 NO MARK
0474  REF  67  LAST  552           37,2517  6 4712 1           AD      ONE
0475                                37,2520  0 0006 1           EXTEND
0476  REF   4  LAST  561           37,2521  1 2527 1           BZF     R21END             ZERO = NO MARK
0478  REF  21  LAST  561           37,2522  3 6211 C           CAF     SIX                MARK THEREFORE TRANSFER IT TO MRKBUF2
0479  REF   8  LAST  561           37,2523  0 5475 1  R21CSM1  TC      GENTRAN            TRANSFER MRKBUF1 TO MRKBUF2
0480  REF  30  LAST  561           37,2524   01725 C           ADRES   MRKBUF1
0481  REF  10  LAST  561           37,2525   01734 C           ADRES   MRKBUF2
0482                                37,2526  0 0003 1           RELINT
0487  REF 135  LAST  561           37,2527  0 4555 C  R21END   TC      BANKCALL
0488  REF   2  LAST  225           37,2530   20464 0           CADR    KLEENEX
04881 REF  28  LAST  559           37,2531  0 5447 C           TC      DOWNFLAG           RESET R21MARK
04882 REF   3  LAST  560           37,2532   00037 C           ADRES   R21MARK            BIT 14  FLAG 2
0491  REF   3  LAST  559           37,2533  0 5423 1           TC      ENDMARK            END MARKING AND ENDJOB
0494                                37,2534   15200 1  V53      VN      5300
0495                                37,2535   01536 C  V0694    VN      0694
```

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P0496   PREFERRED TRACKING ATTITUDE ROUTINE R61CSM
R0497   PROGRAM DESCRIPTION
R0498   MOD NO - 2
R0499   MOD BY - N.BROCOUR
R0500   FUNCTIONAL DESCRIPTION-
R0501     TO COMPUTE THE PREFERRED TRACKING ATTITUDE OF THE CSM TO ENABLE OPTICS
R0502   TRACKING OF THE LM AND TO PERFORM THE MANEUVER TO THE PREFERRED
R0503   OR X-AXIS TRACKING ATTITUDE.
R0504   CALLING SEQUENCE-
R0505           TC      BANKCALL
R0506           CADR    R61CSM
R0507   SUBROUTINES CALLED
R0508     MAKECADR          BANKCALL
R0509     INTPRET           FLAGUP          FLAGDOWN
R0510     BANKJUMP          CRS61.1         R60CSM
R0511     PHASCHNG
R0512   NORMAL EXIT MODES-
R0513     NORMAL RETURN IS TO CALLER + 1
R0517   OUTPUT -
R0518     SEE OUTPUT FOR CRS61.1 & ATTITUDE MANEUVER ROUTINE (R60CSM)
R0519   ERASABLE INITIALIZATION REQUIRED
R0520     GENRET USED TO SAVE Q FOR RETURN
R0521     R61CNTR MUST BE PRESET TO ZERO
R0522   FLAGS SET + RESET
R0523     3-AXIS FLAG
R0524   DEBRIS
R0525     SEE SUBROUTINES
 0527   REF   3  LAST  113   E6,1770                    EBANK= GENRET
 0528   REF   1                                        COUNT* $$/R61          ROUTINES - NAVIGATION - PREF. TR. 9TT=

 0529   REF   9  LAST  527   37,2536   3 4752 C  R61CSM  CAF    EBANK6         SWITCH TO EBANK 6
 0530   REF  27  LAST  559   37,2537   56 003 1          XCH    EBANK
 0531   REF   2  LAST  112   37,2540   55'771 C          TS     SAVBNK         SAVE EBANK
 0532   REF   2  LAST  381   37,2541   0 4604 1          TC     MAKECADR
 0533   REF   4  LAST  562   37,2542   55'770 1          TS     GENRET
 0534   REF   3  LAST  552   37,2543   11'775 1          CCS    R61CNTR        TEST R61CNTR
 0535   REF   1               37,2544   0 2575 1          TC     DECR#61        NOT READY TO DO R61.
 0536                         37,2545   0 2547 C          TC     +2             DO R61
 0537   REF   2  LAST  562   37,2546   0 2576 1          TC     DECR#61 +1
 0538   REF  85  LAST  559   37,2547   0 6006 1          TC     INTPRET
 0539                         37,2550    77624 1          CALL
 0540   REF   1               37,2551    71227 C                 CRS61.1        LOS DETERMINATION + VEH ATTITUDE
 0541                         37,2552    77776 1          EXIT
 0542   REF 248  LAST  559   37,2553   50 154 1          INDEX  MPAC
 0543                         37,2554   0 2555 C          TC     +1
 0544   REF   1               37,2555   0 2574 C          TC     R61END         SUBROUTINE DRIVING DAP (EXIT R61)
A05441                                                                         OR AUTO MODE NOT SET (EXIT R61)
A05442                                                                         OR STIKFLAG SET      (EXIT R61)
 0545   REF  29  LAST  561   37,2556   0 5447 C  R61C1    TC     DOWNFLAG       RESET 3-AXIS FLAG
 0553   REF   3  LAST  389   37,2557    00124 C          ADRES  3AXISFLG       BIT 6  FLAG 5
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0554   REF  68  LAST  561   37,2560  4 4712 C          CS     ONE       SET R61CNTR NEG. TO INDICATE KALCMANU
0555   REF   4  LAST  562   37,2561  55'775 1          TS     R61CNTR

0556   REF  29  LAST  560   37,2562  0 5435 C          TC     UPFLAG    SET FLAG FOR PRIORITY DISPLAYS FOR R60
0557   REF   2  LAST  382   37,2563   00077 1          ADRES  PDSPFLAG  BIT 12  FLAG 4
0558   REF 136  LAST  561   37,2564  0 4555 C          TC     BANKCALL
0559   REF   2  LAST  389   37,2565   56000 1          CADR   R60CSM
0560   REF  30  LAST  562   37,2566  0 5447 C          TC     DOWNFLAG  RESET FLAG FOR PRIORITY DISPLAYS IN R60
0561   REF   3  LAST  563   37,2567   00077 1          ADRES  PDSPFLAG  BIT 12  FLAG 4
0564   REF  28  LAST  555   37,2570  0 5301 C          TC     PHASCHNG
0565                        37,2571   00111 C          OCT    00111
05651  REF 117  LAST  552   37,2572  3 4714 1          CAF    ZERO
05652  REF   3  LAST  562   37,2573  0 2575 1          TC     DECRM61
0567   REF  18  LAST  553   37,2574  3 6214 C  R61END   CAF    THREE

0568   REF   5  LAST  563   37,2575  55'775 1  DECRM61  TS     R61CNTR

0569   REF   5  LAST  562   37,2576  31'770 C          CAE    GENRET
0570   REF 142  LAST  558   37,2577  22 000 1          LXCH   A         RETURN IS IN L
0571   REF   3  LAST  562   37,2600  3 1771 1          CA     SAVBNK    RESTORE EBANK
0572   REF  28  LAST  562   37,2601  56 003 1          XCH    EBANK
0573   REF 143  LAST  563   37,2602  22 000 1          LXCH   A         RETURN IS NOW BACK IN A
0574   REF   6  LAST  382   37,2603  0 4577 C          TC     BANKJUMP  EXIT R61
0575                        13,2176                    BANK   13
0576   REF   1              23,2000                    SETLOC P20S2
0577                        23,3047                    BANK

0578   REF  31  LAST  561   E7,1725                    EBANK= MRKBUF1
```

```
PC579    BVECTOR PERFORMS COMPUTATIONS FOR
R0580    DELTAQ,THE MEASURED DEVIATION BASED ON THE DIFFERENCE BETWEEN THE CSM-LE
R0581    M STATE VECTOR ESTIMATES AND THE ACTUAL TRACKING MEASUREMENT.
R0582    US,THE MODIFIED FICTITIOUS STAR DIRECTION VECTOR
R0583    GEOMETRY VECTOR B ASSOCIATED WITH EACH TRACKING MEASUREMENT.
R0584    INPUT
R0585       UM,1/2 UNIT VECTOR ALONG THE CSM-LM LINE OF SIGHT (BASIC REF.SYSTEM)
R0586       USTAR,FICTITIOUS STAR DIRECTION (1/2 UNIT VECTOR)
R0587       RCLP,RELATIVE CSM TO LM POSITION VECTOR
R0588    OUTPUT
R0589       USTAR,MODIFIED FICTITOUS STAR DIRECTION (1/2 UNIT VECTOR)
R0590       BVECTOR = 9 DIMENSIONAL BVECTOR (1/2 UNIT VEC.)
R0591       DELTAQ = MEASURED DEVIATION
R0592    CALLING SEQUENCE
R0593       L  CALL BVECTORS
R0594    NORMAL EXIT
R0595       L+1 OF CALLING SEQUENCE

 0596    REF   1                                        COUNT  23/20SUB

 0597                          23,3047   77620 0  BVECTORS STQ
 0598    REF   4  LAST  559    23,3050   02317 0           EGRESS
 0599                          23,3051   53575 0           VLOAD  UNIT
 0600    REF   2  LAST  118    23,3052   03531 0           RCLP              RELATIVE POSITION VECTOR
 0601                          23,3053   14033 1           STODL  26D        RCLP UNIT VEC
 0602                          23,3054   00045 0           36D               RCLP ABS VALUE
 0603    REF   1               23,3055   25301 1           STOVL  TEMPCR1    MOVE TO SAFE LOCATION
 0604    REF   2  LAST   77    23,3056   01245 0           USTAR
 0605                          23,3057   53435 0           VXV    UNIT
 0606                          23,3060   00033 1           26D               USTAR = UNIT(US X UCL)
 0607    REF   3  LAST  118    23,3061   37502 1           STCALL BVECTOR
 0608    REF   2  LAST  551    23,3062   56712 0           GRP2PC            PHASE CHANGE
 0609                          23,3063   77775 1           VLOAD
 0610    REF   4  LAST  564    23,3064   03502 0           BVECTOR
 0611    REF   3  LAST  564    23,3065   01245 0           STORE  USTAR
 0612                          23,3066   72441 0           DOT    SL1
 0613    REF   2  LAST   77    23,3067   01235 1           UM                USTAR DOT UM
 0614                          23,3070   45326 1           ACOS   DSU
 0615    REF   3  LAST  391    23,3071   15322 0           DP1/4TH
 0616                          23,3072   41301 0           NORM   DMP
 0617    REF  17  LAST  547    23,3073   00047 1           X1
 0618    REF   1               23,3074   07107 0           PI/4.0
 0619                          23,3075   53605 1           DMP    SRR*
 0620    REF   2  LAST  564    23,3076   01301 1           TEMPCR1           RCLP ABS VALUE
 0621                          23,3077   21576 0           0 -3,1            ADJUST SCALING
 0622    REF   2  LAST  118    23,3100   27524 1           STOVL  DELTAQ
 0623    REF   8  LAST  533    23,3101   15332 1           ZEROVECS
 0624    REF   5  LAST  564    23,3102   03510 0           STORE  BVECTOR +6
 0625    REF   6  LAST  564    23,3103   03516 0           STORE  BVECTOR +12D
 0626                          23,3104   77650 1           GOTO
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0627   REF   5  LAST  564   23,3105   02317 0                    EGRESS
0628                       23,3106   31103 1  PI/4.0   2DEC    .785398164
0628                       23,3107   36652 0
```

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R0629    GETUM-DETERMINES THE LINE OF SIGHT UNIT VECTOR UM IN THE BASIC REFERENC
R0630    E COORDINATE SYSTEM FROM THE OPTICS SHAFT AND TRUNNION ANGLES AND THE IM
R0631    U GIMBAL ANGLES.
R0632    INPUT
R0633       MARKDATA,BASE ADDRESS OF MARK DATA
R0634       REFSMMAT,ROTATION MATRIX FROM STABLE MEMBER TO BASIC REF.COORD.SYSTEM

R0635    SUBROUTINES CALLED-
R0636       SXTNB - SEXT. ANGULAR READINGS TO NAV. BASE COOR.
R0637       NBSM  - TRANSFORM FROM NAV. BASE TO STABLE MEMBER
R0638    OUTPUT
R0639       MPAC = LINE OF SIGHT 1/2 UNIT VECTOR IN BASIC REFERENCE SYSTEM
R0640    CALLING SEQUENCE
R0641       L  CALL GETUM

R0642    NORMAL EXIT
R0643       L+1 OF CALLING SEQUENCE

 0644                          23,3110  40220 C  GETUM    STQ      SETPD
 0645    REF    6  LAST  565   23,3111  02317 C                    EGRESS
 0646                          23,3112  00001 C                    0
 0647                          23,3113  76740 C           LXC,1    VLOAD*
 0648    REF    2  LAST   77   23,3114  01242 1                    MARKDATA        CONTAINS ADDRESS OF MARK DATA
 0649                          23,3115  00002 C                    1,1
 0650    REF    7  LAST  221   23,3116  23676 1           STODL*   MARKDOWN +1     TRANSFER DATA FROM WORKING STORAGE
 0651                          23,3117  00001 C                    0,1             TO MARKDOWN ARRAY FOR DOWNLINK
 0652    REF    8  LAST  566   23,3120  03675 C           STORE    MARKDOWN
 0653                          23,3121  77774 C           AXT,2
 0654                          23,3122  00002 C                    2
 0655                          23,3123  67064 1           XSU,2    SXA,2
 0656    REF   18  LAST  564   23,3124  00046 C                    X1              X1 = MARKDATA
 0657    REF    6  LAST  429   23,3125  00050 1                    S1              S1 = MARKDATA(ADR) +2
 0658                          23,3126  77624 1           CALL
 0659    REF    3  LAST  499   23,3127  46000 C                    SXTNB           SEXT. ANGULAR READINGS TO NAV.BASE COOR.
 0660                          23,3130  77624 1           CALL
 0661    REF    1              23,3131  47541 1                    NBSM            TRANSFORM FROM NAV.BASE TO STABLE MEM.
 0662                          23,3132  76505 C           VXM      VSL1
 0663    REF   14  LAST  553   23,3133  01736 1                    REFSMMAT
 0664                          23,3134  77650 1           GOTO                     MPAC =(UNIT)LINE OF SIGHT VECTOR
 0665    REF    7  LAST  566   23,3135  02317 C                    EGRESS          EXIT
```

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P0666                   RENDEZVOUS TRACKING DATA PROCESSING ROUTINE (R22)

R0667   PURPOSE        (1) TO PROCESS RENDEZVOUS SIGHTING MARK DATA TO UPDATE THE STATE VECTOR OF EITHER THE CSM OR LM AS
R0669                  DEFINED BY THE RENDEZVOUS NAVIGATION PROGRAM (P20).

R0670   ASSUMPTIONS    (1) THIS ROUTINE IS MANUALLY SELECTED BY THE ASTRONAUT BY V55E WHENEVER RENDEZVOUS SIGHTING MARKS
R0672                  ARE DESIRED. ITS SELECTION HOWEVER IS LIMITED TO PERIODS WHEN THE CMC IS HOLDING FOR A V/N FLASHING
R0674                  DATA DISPLAY. THIS ROUTINE RETURNS TO THE ORIGINAL PROGRAM AT THE INTERRUPTED DISPLAY.
 0676                          34,2512                         BANK    34
 0677   REF    1               34,2000                         SETLOC  P20S3
 0678                          34,2512                         BANK

 0679   REF    1                                               COUNT   34/R22

 0680   REF    3  LAST  551    34,2512  3 7663 C  R22          CAF     PRIO26
 0681   REF    2  LAST  195    34,2513  55'056 1               TS      PHSPROT2
 06811  REF    8  LAST  551    34,2514  0 5103 C               TC      PRIOCHNG
 0682   REF    1               34,2515  3 7714 1               CA      NEG3
 0683   REF   11  LAST  561    34,2516  55'734 1               TS      MRKBUF2
 0684   REF   86  LAST  562    34,2517  0 6006 1               TC      INTPRET
 0685                          34,2520   77634 C               RTB
 0687   REF   14  LAST  556    34,2521   45505 C                       LOADTIME
 0688   REF    2  LAST  170    34,2522   01152 C               STORE   VHFTIME         PRESENT TIME
 0689                          34,2523   77624 1  REND1        CALL
 0690   REF    3  LAST  564    34,2524   56712 C                       GRP2PC
 06901                         34,2525   77624 1               CALL
 0691   REF    1               34,2526   56404 1                       WAITONE
 0692                          34,2527   77776 1  REND1A       EXIT
 0694   REF    1               34,2530  3 3220 1               CAF     MKBUFAD         SET MARKSTAT FOR RESTART (CLEARED IN
 0695   REF   31  LAST  559    34,2531  55'330 1               TS      MARKSTAT          FRESH START)
 0700   REF   12  LAST  567    34,2532  3 1734 C               CA      MRKBUF2
 0701                          34,2533  0 0006 1               EXTEND
 0702   REF    1               34,2534  1 2537 C               BZF     REND2
 0703                          34,2535  0 0006 1               EXTEND
 0704   REF    1               34,2536  6 2556 C               BZMF    REND3A
 0705   REF   22  LAST  561    34,2537  3 6211 C  REND2        CAF     SIX
 0706   REF    9  LAST  561    34,2540  0 5475 1               TC      GENTRAN
 0707   REF   13  LAST  567    34,2541   01734 C               ADRES   MRKBUF2
 0708   REF    3  LAST  551    34,2542   01224 1               ADRES   MARKTIME       MARKTIME MUST BE CONTIGUOUS WITH VTEMP
 0718   REF    2  LAST  567    34,2543  3 7714 1               CAF     NEG3            NEG VALUE TO INDICATE VALUES USED
 0719   REF   14  LAST  567    34,2544  55'734 1               TS      MRKBUF2
 0720                          34,2545  0 0003 1               RELINT
 0721   REF   87  LAST  567    34,2546  0 6006 1               TC      INTPRET
 0722                          34,2547   45014 C               CLEAR   CALL
 0723   REF    1               34,2550   04667 1                       SOURCFLG        0 = OPTICS DATA
 0724   REF    4  LAST  567    34,2551   56712 C                       GRP2PC          PHASE CHANGE
 0725                          34,2552   52131 C               SSP     GOTO
 0726   REF    3  LAST  566    34,2553   01243 C                       MARKDATA
 0727   REF    2  LAST   77    34,2554   01224 1               ECADR   VTEMP -2
 0728   REF    1               34,2555   70601 1                       REND4
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0729	REF	88	LAST	567	34,2556	0 6006	1	REND3A	TC	INTPRET
0732					34,2557	77624	1	REND3	CALL	
07321	REF	5	LAST	567	34,2560	56712	0			GRP2PC
07322					34,2561	77624	1		CALL	
0733	REF	2	LAST	567	34,2562	56404	1			WAITCNE
0734					34,2563	77614	1		BOFF	
0736	REF	4	LAST	257	34,2564	04746	0			VHFRFLAG
0737	REF	1			34,2565	70527	0			REND1A
0738					34,2566	77634	0		RTB	
0739	REF	15	LAST	567	34,2567	45505	0			LOADTIME PRESENT TIME
0740					34,2570	45225	0		DSU	DSU
0741	REF	1			34,2571	14647	1			60SECDP 1 MIN
0742	REF	3	LAST	567	34,2572	01152	0			VHFTIME LAST READING OF RADAR
0743					34,2573	45040	1		BMN	CALL
0744	REF	2	LAST	568	34,2574	70527	0			REND1A
0745	REF	1			34,2575	56415	1			RANGERD READ RADAR RANGE
0746					34,2576	77745	1		DLOAD	
0747	REF	4	LAST	567	34,2577	01225	0			MARKTIME
0748	REF	4	LAST	568	34,2600	01152	0		STORE	VHFTIME FOR DOWNLINK
0749					34,2601	77624	1	REND4	CALL	
0750	REF	3	LAST	551	34,2602	56343	0			SETINTG SET INTEGRV FLAGS
0751					34,2603	45014	0		BON	CALL
0752	REF	6	LAST	551	34,2604	00707	1			VEHUPFLG
0753	REF	1			34,2605	71035	1			CSMUPP BRANCH IF CSM UPDATE
0754	REF	5	LAST	551	34,2606	27113	1			INTEGRV
0755					34,2607	77624	1		CALL	
0756	REF	6	LAST	568	34,2610	56712	0			GRP2PC PHASE CHANGE
0757					34,2611	77624	1		CALL	
0758	REF	4	LAST	568	34,2612	56343	0			SETINTG SET INTEGRV FLAGS
0759					34,2613	77614	1		CLEAR	
0760	REF	6	LAST	551	34,2614	01674	0			VINTFLAG SET INTEGRATION VEHICLE TO LM
0761					34,2615	43014	0	REND5	BOFF	SET
0762	REF	4	LAST	551	34,2616	02756	1			RENDWFLG
0763	REF	1			34,2617	70621	0			REND5A DO NOT INTEGRATE W IF FLAG = 0
0764	REF	4	LAST	551	34,2620	01476	0			DIMOFLAG
0765					34,2621	77624	1	REND5A	CALL	
0766	REF	6	LAST	568	34,2622	27113	1			INTEGRV
0767					34,2623	77624	1		CALL	
0768	REF	1			34,2624	56526	0			SHIFTNDX SET EARTH MOON SCALING INDEX
0769					34,2625	77624	1		CALL	
0770	REF	1			34,2626	71124	0			CMPOS SET CSM POSITION
0771					34,2627	45014	0		SET	CALL
0772	REF	1			34,2630	02464	0			INCORFLG SET FOR 1ST PASS
0773	REF	1			34,2631	71133	0			LMPOS SET LM POSITION
0774					34,2632	43014	0		CLEAR	BON
0775	REF	2	LAST	202	34,2633	01671	0			ORBWFLAG CLEAR FOR ORBITAL AND CISLUNAR
0776	REF	5	LAST	568	34,2634	02716	0			RENDWFLG
0777	REF	1			34,2635	70645	1			REND6
0778					34,2636	77745	1		DLOAD	
07781	REF	1			34,2637	02001	1			WRENDPOS

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07782                          34,2640  34001 1          STCALL 0          0 = WRENDPOS   1= WRENDVEL
0779   REF   1                 34,2641  56544 1                 INITIALW   INITIALIZE W MATRIX
07791                          34,2642  77745 1          DLOAD
07792  REF   9  LAST  564      34,2643  15332 1                 ZEROVECS
07793  REF   6  LAST  550      34,2644  01126 0          STORE  VHFCNT     ZERO OUT VHFCNT AND TRKMKCNT
0780                           34,2645  77614 1  REND6   SET
0781   REF   6  LAST  568      34,2646  02476 0                 RENDWFLG
0782                           34,2647  52375 1          VLOAD  VSU
0783   REF   2  LAST   77      34,2650  01215 0                 LEMPOS
0784   REF   2  LAST   77      34,2651  01207 0                 CSMPOS
0785   REF   3  LAST  564      34,2652  03531 0          STORE  RCLP       LM - CSM
0786                           34,2653  43056 0  REND7   UNIT   BON
0787   REF   2  LAST  567      34,2654  04707 0                 SOURCFLG
0788   REF   1                 34,2655  71046 0                 REND14    BRANCH IF DATA IS RADAR
0789   REF   1                 34,2656  01273 0          STORE  UCL
0790                           34,2657  45014 0          BOFF   CALL
0791   REF   2  LAST  568      34,2660  02744 1                 INCORFLG
0792   REF   1                 34,2661  70673 1                 REND9
0793   REF   1                 34,2662  47110 1                 GETUP     CALCULATE UM LINE OF SIGHT
0794   REF   3  LAST  564      34,2663  25235 1          STOVL  UM
0795   REF   2  LAST  569      34,2664  01273 0                 UCL
0796                           34,2665  40035 0          VXV    BOV
0797   REF   4  LAST  569      34,2666  01235 1                 UM        UCL X UM
0798   REF   1                 34,2667  70670 1                 REND8
0799                           34,2670  40056 0  REND8   UNIT   BOV
0800   REF   1                 34,2671  70557 1                 REND3     BRANCH IF OVERFLOW IGNORE MARK
0801   REF   4  LAST  564      34,2672  01245 0          STORE  USTAR
0802                           34,2673  77624 1  REND9   CALL
0803   REF   1                 34,2674  47047 1                 BVECTORS
0804                           34,2675  77214 0          BON    VLOAD
0805   REF   7  LAST  568      34,2676  00707 1                 VEHUPFLG
0806   REF   1                 34,2677  70703 1                 REND9A
0807   REF   7  LAST  564      34,2700  03502 0                 BVECTOR
0808                           34,2701  77676 0          VCOMP
0809   REF   8  LAST  569      34,2702  03502 0          STORE  BVECTOR
0810                           34,2703  77624 1  REND9A  CALL
08101  REF   7  LAST  568      34,2704  56712 0                 GRP2PC
08102                          34,2705  77614 1          BON
0811   REF   3  LAST  250      34,2706  00706 0                 R23FLG
0812   REF   1                 34,2707  71077 1                 REND15    BRANCH IF BACKUP OPTICS (R23 WORKING)
0813                           34,2710  43345 1          DLOAD  DAD
0814   REF   1                 34,2711  31222 1                 SXTVAR
0815   REF   1                 34,2712  31224 1                 IMUVAR
0816   REF   2  LAST  118      34,2713  27526 0  REND10  STOVL  VARIANCE   TEMP STORAGE FOR VARIANCE CALC.
0817   REF   4  LAST  569      34,2714  03531 0                 RCLP
0818                           34,2715  60246 1          ABVAL  NORM
0819   REF  19  LAST  566      34,2716  00047 1                 X1
0820                           34,2717  41316 0          DSQ    DMP
0821   REF   3  LAST  569      34,2720  03526 0                 VARIANCE
0822                           34,2721  45070 1          XAD,1  CALL
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0823	REF	20	LAST	569	34,2722	00046	0		X1	
0824	REF	2	LAST	568	34,2723	56526	0		SHIFTNDX	GET EARTH MOON SCALING INDEX
0825					34,2724	56070	0	XAD,1	XAD,1	
0826	REF	7	LAST	544	34,2725	00047	1		X2	
0827	REF	8	LAST	570	34,2726	00047	1		X2	
0828					34,2727	72257	1	SR*	TLOAD	
0829					34,2730	20577	0		0 -2,1	ADJUST SCALING TO B-40
0830	REF	249	LAST	562	34,2731	00155	0		MPAC	
0831	REF	4	LAST	569	34,2732	03526	0	STORE	VARIANCE	
08311					34,2733	54335	0	SLOAD	SR	
083114	REF	2	LAST	89	34,2734	02400	1		INTVAR	INTEGRATION VARIANCE SCALED B-15
083118					34,2735	20632	1		25D	SCALE IT B-40
083122					34,2736	77771	0	TAD		
083126	REF	5	LAST	570	34,2737	03526	0		VARIANCE	
08313	REF	6	LAST	570	34,2740	03526	0	STORE	VARIANCE	
0832					34,2741	76214	1	BOFF	TAD	
0833	REF	3	LAST	569	34,2742	04747	1		SOURCFLG	BRANCH IF NOT VHF RADAR
0834	REF	1			34,2743	70752	0		RENDICA	
0835	REF	1			34,2744	03005	1		RVARMIN	VHF RADAR MIN. VARIANCE
0836					34,2745	72244	0	BPL	TLOAD	
0837	REF	2	LAST	570	34,2746	70752	0		RENDICA	
0838	REF	2	LAST	570	34,2747	03005	1		RVARMIN	
08381					34,2750	77646	0	ABS		MIN. VALUE WAS STORED AS NEG.
0839	REF	7	LAST	570	34,2751	03526	0	STORE	VARIANCE	STORE MIN. VALUE
0840					34,2752	45014	0	RENDIOA CLEAR	CALL	
0841	REF	1			34,2753	02666	0		DMENFLG	CLEAR FOR 6 X 6 W MATRIX
0842	REF	1			34,2754	75250	1		INCORP1	CALCULATE UPDATE
08421					34,2755	77624	1	CALL		
08422	REF	8	LAST	569	34,2756	56712	0		GRP2PC	
0843					34,2757	45014	0	BOFF	CALL	
0844	REF	3	LAST	569	34,2760	02744	1		INCORFLG	
0845	REF	1			34,2761	71007	0		REND12	
0846	REF	3	LAST	570	34,2762	56526	0		SHIFTNDX	GET EARTH MOON SCALING INDEX
0847					34,2763	51575	1	VLOAD	ABVAL	
0848	REF	5	LAST	77	34,2764	01265	1		DELTAX +6	
0849					34,2765	77657	0	SR*		
0850					34,2766	57176	0		0,2	
0851	REF	4	LAST	273	34,2767	27504	0	STOVL	N49DISP +2	
0852	REF	6	LAST	570	34,2770	01257	0		DELTAX	
0853					34,2771	53646	0	ABVAL	SR*	
0854					34,2772	57176	0		0,2	
0855	REF	5	LAST	570	34,2773	03502	0	STORE	N49DISP	
08551					34,2774	77735	0	SLOAD		
0856	REF	1			34,2775	02003	0		RMAX	
0857					34,2776	45261	0	SR	DSU	
0858					34,2777	20613	1		10D	
0859	REF	6	LAST	570	34,3000	03502	0		N49DISP	
0860					34,3001	67240	0	BMN	SLOAD	
0861	REF	1			34,3002	71142	0		RENDISP	BRANCH IF PCS UP.GREATER THAN MAX.
0862	REF	1			34,3003	02004	1		VMAX	

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0863                                34,3004  50025 C            DSU     BMN
0864  REF  7  LAST  57C             34,3005  03504 0                    N49DISP +2
0865  REF  2  LAST  57C             34,3006  71142 C                    RENDISP          BRANCH IF VEL.UPDATE GREATER THAN MAX.
0866                                34,3007  77624 1  REND12    CALL
0869  REF  1                       34,3010  75460 1                    INCORP2          INCORPORATE UPDATE VALUES INTO STATE VEC
0870                                34,3011  43014 C            BON     BOFF
0871  REF  4  LAST  57C             34,3012  04707 C                    SOURCFLG
0872  REF  1                       34,3013  71104 1                    REND16           BRANCH IF DATA IS RADAR
0873  REF  4  LAST  57C             34,3014  02744 1                    INCORFLG
0874  REF  1                       34,3015  71112 C                    REND17
0875                                34,3016  77624 1            CALL
0876  REF  4  LAST  57C             34,3017  56526 C                    SHIFTNDX         GET EARTH NCON SCALING INDEX
0877                                34,3020  45014 C            BON     CALL
0878  REF  8  LAST  569             34,3021  00707 1                    VEHUPFLG
0879  REF  1                       34,3022  71120 1                    REND18           BRANCH IF CSM UPDATE
0880  REF  2  LAST  568             34,3023  71133 C                    LMPOS            GET LM POSITION
0881                                34,3024  77624 1  REND13    CALL
0882  REF  9  LAST  57C             34,3025  56712 C                    GRP2PC           PHASE CHANGE
0883                                34,3026  52375 1            VLOAD   VSU
0884  REF  3  LAST  569             34,3027  01215 C                    LEMPOS
0885  REF  3  LAST  569             34,3030  01207 0                    CSMPOS
0886  REF  5  LAST  569             34,3031  03531 C            STORE   RCLP             LM - CSM
0887                                34,3032  77614 1            CLRGO
0888  REF  5  LAST  571             34,3033  02624 C                    INCORFLG
0889  REF  1                       34,3034  70653 C                    REND7            BRANCH FOR 2ND PASS THIS OPTICS MARK
0890                                34,3035  45014 C  CSMUPP    CLEAR   CALL
0891  REF  7  LAST  568             34,3036  01674 C                    VINTFLAG         SET INTEGRATION VEHICLE EQ LM
0892  REF  7  LAST  568             34,3037  27113 1                    INTEGRV
0893                                34,3040  77624 1            CALL
0894  REF 10  LAST  571             34,3041  56712 C                    GRP2PC           PHASE CHANGE
0895                                34,3042  77624 1            CALL
0896  REF  5  LAST  568             34,3043  56343 C                    SETINTG          SET FLAGS FOR INTEGRATION
0897                                34,3044  77650 1            GOTO
0898  REF  1                       34,3045  70615 1                    REND5
0899  REF  9  LAST  569             34,3046  27502 C  REND14    STOVL   BVECTOR          VHF RADAR BVECTOR
0900  REF 10  LAST  569             34,3047  15332 1                    ZEROVECS
0901  REF 10  LAST  571             34,3050  03510 C            STORE   BVECTOR +6
0902  REF 11  LAST  571             34,3051  27516 C            STOVL   BVECTOR +120
0903  REF  6  LAST  571             34,3052  03531 0                    RCLP
0904                                34,3053  71256 C            UNIT    DLOAD
0905  REF  1                       34,3054  01257 C                    VHFRANGE         VHFRANGE SCALED B-27
0906                                34,3055  60414 C            BON     SR2
0907  REF  7  LAST  508             34,3056  04303 C                    MOONTHIS
0908                                34,3057  71060 1                    +1
0909                                34,3060  43025 1            DSU     SET
0910                                34,3061  00045 C                    36D              ABVAL (RCLP)
0911  REF  6  LAST  571             34,3062  02464 C                    INCORFLG
0912  REF  3  LAST  564             34,3063  03524 1            STORE   DELTAC
0913                                34,3064  77214 C            BOFF    VLOAD
0914  REF  9  LAST  571             34,3065  00747 C                    VEHUPFLG
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0915  REF   1                  34,3066  71072 1                 REND14A
0916  REF  12  LAST  571       34,3067  03502 0                 BVECTOR
0917                           34,3070  77676 0          VCOMP
0918  REF  13  LAST  572       34,3071  03502 0          STORE  BVECTOR
0919                           34,3072  77624 1  REND14A CALL
09191 REF  11  LAST  571       34,3073  56712 0                 GRP2PC
09192                          34,3074  52145 0          DLOAD  GOTO
0920  REF   1                  34,3075  03003 1                 RVAR
0921  REF   1                  34,3076  70713 0                 REND10
0922                           34,3077  43335 0  REND15  SLOAD  DAD      GET ALT LOS VARIANCE
0923  REF   1                  34,3100  01357 1                 ALTVAR   BACKUP OPTICS
0924  REF   2  LAST  569       34,3101  31224 1                 IMUVAR   IMU VARIANCE
0925                           34,3102  77650 1          GOTO
0926  REF   2  LAST  572       34,3103  70713 0                 REND10
0927                           34,3104  62150 1  REND16  LXA,1  INCR,1
0928  REF   7  LAST  569       34,3105  01125 0                 VHFCNT   VHF RADAR UPDATE COUNT
0929                           34,3106  00001 0          DEC    1
0930                           34,3107  52130 1          SXA,1  GOTO
0931  REF   8  LAST  572       34,3110  01125 0                 VHFCNT   UPDATE COUNT
0932  REF   1                  34,3111  70523 1                 REND1
0933                           34,3112  62150 1  REND17  LXA,1  INCR,1
0934  REF   4  LAST  550       34,3113  01126 0                 TRKMKCNT OPTICS MARK COUNT
0935                           34,3114  00001 0          DEC    1
0936                           34,3115  52130 1          SXA,1  GOTO
0937  REF   5  LAST  572       34,3116  01126 0                 TRKMKCNT UPDATE COUNT
0938  REF   2  LAST  569       34,3117  70557 1                 REND3
0939                           34,3120  77624 1  REND18  CALL
0940  REF   2  LAST  568       34,3121  71124 0                 CMPOS    GET CSM POSITION
0941                           34,3122  77650 1          GOTO
0942  REF   1                  34,3123  71024 1                 REND13
0943                           34,3124  53775 1  CMPOS   VLOAD  VSR*
0944  REF   1                  34,3125  01573 1                 DELTACSM
0945                           34,3126  57167 0                 7,2
0946                           34,3127  77655 1          VAD
0947  REF   1                  34,3130  01607 1                 RCVCSM
0948  REF   4  LAST  571       34,3131  01207 0          STORE  CSMPOS   CSM POSITION SCALED B-27 OR B-29
0949                           34,3132  77616 0          RVQ
0950                           34,3133  53775 1  LMPOS   VLOAD  VSR*
0951  REF   1                  34,3134  01645 1                 DELTALEM
0952                           34,3135  57167 0                 7,2
0953                           34,3136  77655 1          VAD
0954  REF   1                  34,3137  01661 1                 RCVLEM
0955  REF   4  LAST  571       34,3140  01215 0          STORE  LEMPOS   LM POSITION SCALED B-27 OR B-29
0956                           34,3141  77616 0          RVQ
0963                           34,3142  77776 1  RENDISP EXIT
0964  REF   8  LAST  494       34,3143  3 0105 0         CA     FLAGWRD9
0965  REF  22  LAST  434       34,3144  7 4703 0         MASK   BIT8
0966                           34,3145  0 0006 1         EXTEND
0967                           34,3146  1 3151 0         BZF    +3
0968  REF  24  LAST  558       34,3147  3 4711 1         CA     BIT2
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0969                                  34,3150  0 3152 1            TC      +2
0970    REF   38  LAST  507           34,3151  3 4712 1            CA      BIT1
0971    REF    8  LAST  571           34,3152  55'505 1            TS      N49DISP +4
09711   REF  118  LAST  563           34,3153  3 4714 1            CAF     ZERO          SET TEMPOR1 > ZERO TO INDICATE
09712   REF    3  LAST  564           34,3154  55'300 1            TS      TEMPOR1       V06 N49 DISPLAY HASNT BEEN ANSWERED
09713   REF   29  LAST  563           34,3155  0 5301 0            TC      PHASCHNG
09714                                 34,3156   04022 0            OCT     04022
09715   REF    1                      34,3157  3 7664 1            CAF     PRIO27        SET UP DISPLAY JOB WITH HIGHER PRIORITY
09716   REF   17  LAST  559           34,3160  0 5027 1            TC      NOVAC
097165  REF   32  LAST  563           E7,1725                      EBANK=  MRKBUF1       THAN PRESENT JOB
09717   REF    1                      34,3161   03173 1            2CADR   RENDISP2
09717   REF    1                      34,3162   70067 1
097175  REF   89  LAST  568           34,3163  0 6006 1 RENDISP7   TC      INTPRET
097177  REF  250  LAST  570           34,3164   00155 0            STORE   MPAC
097179                                34,3165   53135 0            SLOAD   BZE
097181  REF    4  LAST  573           34,3166   01301 1                    TEMPOR1
097183  REF    1                      34,3167   71164 1                    RENDISP7 +1   DISPLAY HAS NOT BEEN ANSWERED YET
097185                                34,3170   52040 1            BMN     GOTO
097187  REF    2  LAST  570           34,3171   71007 0                    REND12        NEG INDICATES PROCEED
097189  REF    1                      34,3172   71202 1                    RENDISP3      POS INDICATES RECYCLE
0972    REF    1                      34,3173  3 3225 1 RENDISP2   CAF     V06N49
0973    REF  137  LAST  563           34,3174  0 4555 0            TC      BANKCALL
0974    REF    1                      34,3175   20635 0            CADR    PRIODSP
0975    REF    2  LAST  383           34,3176  0 4550 0            TC      GOTOV56       TERM EXIT P20 VIA V56
0976    REF   69  LAST  563           34,3177  4 4712 0            CS      ONE           NEG INDICATES PROCEED RENDISP7 JOB
0977    REF    5  LAST  573           34,3200  55'300 1            TS      TEMPOR1       POS INDICATES RECYCLE RENDISP7 JOB
0978    REF   74  LAST  559           34,3201  0 5112 0            TC      ENDOFJOB      GO COMPLETE ABOVE JOB
0986                                  34,3202   77614 1 RENDISP3   BON
0988    REF    5  LAST  571           34,3203   04707 0                    SOURCFLG
0989    REF    2  LAST  572           34,3204   70523 1                    REND1         DATA WAS RADAR GO LOOK FOR OPTICS NEXT
0990                                  34,3205   77776 1            EXIT
0991    REF   33  LAST  573           E7,1725                      EBANK=  MRKBUF1
0992                                  34,3206  0 0004 0            INHINT
0993    REF    1                      34,3207  3 3226 1            CAF     BUFBANK
0994    REF   13  LAST  411           34,3210  54 006 0            TS      BBANK
0995    REF   13  LAST  560           34,3211  3 7716 0            CA      NEGONE
0996    REF   34  LAST  573           34,3212  55'725 1            TS      MRKBUF1       ERASE MARK ONE BUFFER
0997    REF   15  LAST  567           34,3213  55'734 1            TS      MRKBUF2       ERASE MARK TWO BUFFER
0998                                  34,3214  0 0003 1            RELINT
0999    REF   90  LAST  573           34,3215  0 6006 1 RENDISP4   TC      INTPRET
1000                                  34,3216   77650 1            GOTO
1001    REF    3  LAST  572           34,3217   70557 1                    REND3
10015   REF   16  LAST  573           34,3220   03734 1 MKBUFAD    ECADR   MRKBUF2
1002                                  34,3221   00052 0 SXTVAR     2DEC    0.04 E-6 B+16 SXT ERROR VARIANCE = .04 (MR)SQ
1002                                  34,3222   36307 0
1003                                  34,3223   00052 0 IMUVAR     2DEC    0.04 E-6 B+16 IMU ERROR VARIANCE = .04 (MR)SQ
1003                                  34,3224   36307 0
1008                                  34,3225   01461 0 V06N49     VN      0649
1009    REF   35  LAST  573           E7,1725                      EBANK=  MRKBUF1
1010    REF    2  LAST  573           34,3226   70067 1 BUFBANK    BBCON   RENDISP3
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1011                          31,2021                    BANK    31
1012  REF   1                 27,2000                    SETLOC  R22S1
1013                          27,2343                    BANK
1014                          27,2343   45020 1  SETINTG  STQ     CALL
1015  REF   8  LAST  566      27,2344   02317 0           EGRESS
1016  REF  14  LAST  509      27,2345   27371 1           INTSTALL      RESERVE INTEGRATION
1017                          27,2346   43145 0           DLOAD   SET
1018  REF   5  LAST  568      27,2347   01225 0           MARKTIME
1019  REF   1                 27,2350   01472 1           STATEFLG
1020  REF  27  LAST  553      27,2351   00041 1           STORE   TDEC1         MARKTIME
1021                          27,2352   43014 0           CLEAR   CLEAR
1022  REF   8  LAST  501      27,2353   01673 1           INTYPFLG      PRECISION INTEGRATION
1023  REF   5  LAST  568      27,2354   01676 1           DIMOFLAG
1024                          27,2355   43014 0           SET     CLRGO
1025  REF   8  LAST  571      27,2356   01474 1           VINTFLAG      SET VEHICLE EQ. CSM
1026  REF   1                 27,2357   01635 0           D6OR9FLG      SET W MATRIX DIM. EQ 6
1027  REF   9  LAST  574      27,2360   02317 0           EGRESS        EXIT
1028                          27,2361   77620 0  CNTCHK   STQ
1029  REF   2  LAST   76      27,2362   01150 1           POINTEX
10291                         27,2363   77614 1  CONTCHK  BOFF
10292 REF   3  LAST  527      27,2364   01742 1           REFSMFLG      BRANCH TO END OF JOB IF REFSMMAT NO GOOD
10293 REF   1                 27,2365   30147 0           ENDPLAC
1030                          27,2366   50135 0           SLOAD   BMN
10301 REF   6  LAST  563      27,2367   03376 0           R61CNTR
10302 REF   1                 27,2370   56406 0           WAITCNE1
10303                         27,2371   43014 0           BON     BOFF          IS TRACK FLAG SET
1031  REF  12  LAST  551      27,2372   00710 1           UPDATFLG
1032  REF   3  LAST  574      27,2373   01150 1           POINTEX
1033  REF   4  LAST  551      27,2374   00752 1           TRACKFLG
1034  REF   2  LAST  574      27,2375   30147 0           ENDPLAC
1035                          27,2376   77776 1           EXIT
1036  REF  30  LAST  573      27,2377   0 5301 0  REDOR22  TC      PHASCHNG
1037                          27,2400   00132 1           OCT     00132
1038  REF   4  LAST  567      27,2401   3 7663 0          CAF     PRIO26
1039  REF   9  LAST  567      27,2402   0 5103 0          TC      PRIOCHNG
1040  REF   3  LAST  568      27,2403   0 2407 0          TC      WAITCNE +3
1041                          27,2404   77620 0  WAITONE  STQ
1042  REF   4  LAST  574      27,2405   01150 1           POINTEX
10421                         27,2406   77776 1  WAITONE1 EXIT
1043  REF   2  LAST  138      27,2407   3 4740 0          CAF     4SECS         WAIT 4 SECS.
1044  REF 138  LAST  573      27,2410   0 4555 0          TC      BANKCALL
1045  REF   7  LAST  534      27,2411   01730 1           CADR    DELAYJOB
1046  REF  91  LAST  573      27,2412   0 6006 1          TC      INTPRET
1047                          27,2413   77650 1           GOTO
1048  REF   1                 27,2414   56363 1           CONTCHK       CHECK AGAIN NOW
1049                          27,2415   77776 1  RANGERD  EXIT
1050                          27,2416   0 0004 0          INHINT
1051  REF   1                 27,2417   4 2472 0          CS      OCT17
1052                          27,2420   0 0006 1          EXTEND
1053  REF   6  LAST  379      27,2421   03 013 0          WAND    CHAN13        ZERO OUT BITS 1-4 OF CHANNEL 13
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1054   REF   1                 27,2422  3 4334 1          CAF     OCT11
1055                           27,2423  0 0006 1          EXTEND
1056   REF   7  LAST  574       27,2424  05 013 0          WOR     CHAN13          GENERATE SHIFT PULSES TO RADR,SET R.BIT
1057                           27,2425  0 0003 1          RELINT
1058                           27,2426  0 0006 1          EXTEND
1059   REF  18  LAST  561       27,2427  3 0025 0          DCA     TIME2
1060   REF   6  LAST  574       27,2430  53*225 1          DXCH    MARKTIME        READ PRESENT TIME
1061   REF 135  LAST  574       27,2431  0 4555 0          TC      BANKCALL
1062   REF   1                 27,2432   17514 1          CADR    RADSTALL        WAIT FOR RANGE COMPLETE
1063   REF   1                 27,2433  0 2461 0          TC      LIGHTON         BAD DATA GOOD BIT
10635  REF   2  LAST  257       27,2434  0 5520 0          TC      TRFAILOF        TURN TRACKER LIGHT OFF
1065   REF  52  LAST  574       27,2435  0 6006 1  RANGERD1 TC      INTPRET
1066                           27,2436   50135 0          SLOAD   BMN
1067   REF   2  LAST  122       27,2437   03704 1          RM
10671  REF   1                 27,2440   56447 0          RANGERD3
1068                           27,2441   77605 1          DMP
1069   REF   1                 27,2442   16475 0                  CONVRNGE        CONVERT RANGE TO METERS B-27
10691                          27,2443   77614 1  RANGERD2 SET
1070   REF   6  LAST  573       27,2444   04467 0                  SOURCFLG        SOURCE OF DATA TO VHF RADAR
1071   REF   2  LAST  571       27,2445   01257 0          STORE   VHFRANGE
1072                           27,2446   77616 0          RVQ
10721                          27,2447   77776 1  RANGERD3 EXIT
10722  REF 251  LAST  573       27,2450  3 0154 1          CA      MPAC
10723  REF  13  LAST  536       27,2451  7 4672 1          MASK    POSMAX
10724  REF 252  LAST  575       27,2452  54 154 0          TS      MPAC            MASK OUT NEG. SIGN BIT
10725  REF  93  LAST  575       27,2453  0 6006 1          TC      INTPRET
1073                           27,2454   77605 1          DMP
10731  REF   2  LAST  575       27,2455   16475 0                  CONVRNGE        CONVERT FROM NM TO METERS AND SCALE B-27
10732                          27,2456   52015 1          DAD     GOTO
10733  REF   1                 27,2457   16471 1                  RANGEB14        VALUE IN METERS OF SIGN BIT SCALED B-27
10734  REF   1                 27,2460   56443 1                  RANGERD2
10738  REF   1                 27,2461  0 5532 0  LIGHTON  TC      TRFAILON        TURN TRACKER LIGHT ON
107406 REF  94  LAST  575       27,2462  0 6006 1          TC      INTPRET
10741                          27,2463   77745 1          DLOAD
10742  REF   7  LAST  575       27,2464   01225 0                  MARKTIME
10743  REF   5  LAST  568       27,2465   01152 0          STORE   VHFTIME
1075                           27,2466   77650 1          GOTO
1076   REF   3  LAST  573       27,2467   70523 1                  RENDI
10761                          27,2470   00045 0  RANGEB14 2DEC    303431.7 B-27   16384 X 18.52 SCALED B-27
10761                          27,2471   01217 1
1077                           27,2472   00017 1  OCT17    OCT     00017
10781                          27,2473   40200 1  OC40200  OCT     40200
1079                           27,2474   00045 0  CONVRNGE 2DEC    18.52 B-13      VHF INPUT RANGE CONV.FROM.01 NM TO M
1079                           27,2475   01217 1
1080                           27,2476  0 0006 1  VHFREAD  EXTEND
1081   REF   9  LAST  366       27,2477  04 007 1          ROR     SUPERBNK        MUST SAVE SBANK BECAUSE OF RUPT
1082   REF   5  LAST  537       27,2500  54 016 1          TS      BANKRUPT        EXITS VIA TASKOVER BADEND OR GOODEND
10821  REF 119  LAST  573       27,2501  4 4714 0          CS      ZERO
10822  REF   2  LAST   71       27,2502  54 734 0          TS      RUPTAGN
1083                           27,2503  0 0006 1          EXTEND
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1084   REF   5  LAST  537   27,2504  22 012 1          QXCH   QRUPT
10841  REF  32  LAST  437   27,2505  3 4704 0          CAF    BIT7
10842  REF  35  LAST  552   27,2506  7 0075 1          MASK   STATE +1        UPDATE FLAG
10843                        27,2507  0 0006 1          EXTEND
10844  REF   1               27,2510  1 2520 0          BZF    BYPASS
1085   REF   1               27,2511  3 0046 0          CA     RNRAD
1086   REF   3  LAST  575   27,2512  55*703 0          TS     RM              SAVE RANGE
1087   REF  25  LAST  572   27,2513  3 4711 1          CAF    BIT2
1088                        27,2514  0 0006 1          EXTEND
1089   REF   5  LAST  181   27,2515  02 033 0          RAND   CHAN33          READ DATA GOOD BIT
1094                        27,2516  0 0006 1          EXTEND
1095   REF   1               27,2517  1 2523 0          BZF    VHFGOOD         BRANCH IF DATA GOOD BIT EQUALS GOOD
1096   REF  30  LAST  548   27,2520  3 4711 1 BYPASS   CAF    TWO
1097   REF  37  LAST  528   27,2521  0 4574 0          TC     POSTJUMP
1098   REF   1               27,2522   17464 1          CADR   BADEND
1099   REF  31  LAST  576   27,2523  3 4711 1 VHFGOOD  CAF    TWO
1100   REF  38  LAST  576   27,2524  0 4574 0          TC     POSTJUMP
1101   REF   2  LAST  226   27,2525   17467 1          CADR   GOODEND
1102                        27,2526   43174 1 SHIFTNOX  AXT,2  BON
1103                        27,2527   00000 1                  0
1104   REF  10  LAST  571   27,2530   00707 1                  VEHUFFLG
1105   REF   1               27,2531   56537 0                  SHIFTA          VEHICLE IS CSM
1106                        27,2532   43414 1          BON    RVQ
1107   REF   2  LAST   32   27,2533   04304 1                  LMOONFLG
1108                        27,2534   56535 1                  +1
1109                        27,2535   43514 0          INCR,2 RVQ
1110                        27,2536   77775 1          DEC    -2
1111                        27,2537   43414 1 SHIFTA   BON    RVQ
1112   REF   7  LAST  553   27,2540   04303 0                  CMOONFLG
1113                        27,2541   56542 1                  +1              MOON ORB.
1114                        27,2542   43514 0          INCR,2 RVQ
1115                        27,2543   77775 1          DEC    -2
1116                        27,2544   66370 0 INITIALW AXT,1  SSP
1117                        27,2545   00044 1                  36D
1118   REF   7  LAST  566   27,2546   00051 0                  S1
1119                        27,2547   00006 1                  6
1120                        27,2550   77775 1          VLOAD
1121   REF  11  LAST  571   27,2551   15332 1                  ZEROVECS
1122   REF   5  LAST  260   27,2552   06445 1 INITA    STORE  W +36D,1        CLEAR 0 - 35
1123                        27,2553   76100 1          TIX,1  AXT,1
1124   REF   1               27,2554   56552 0                  INITA
11241                       27,2555   00044 1                  36D
11242  REF   6  LAST  576   27,2556   06533 1 INITB    STORE  W +90D,1        CLEAR 54 - 89
11243                       27,2557   67300 0          TIX,1  SLOAD
11244  REF   1               27,2560   56556 1                  INITB
1125                        27,2561   00001 0                  0               POSITION VALUE
1127   REF   7  LAST  576   27,2562   02401 0          STORE  W               INITIALIZE DIAGONAL W  POSITION
1128   REF   8  LAST  576   27,2563   02411 1          STORE  W +8D
1129   REF   9  LAST  576   27,2564   02421 1          STORE  W +16D
1130                        27,2565   77735 0          SLOAD
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 1131                                27,2566   00002 0                1          VELOCITY VALUE
 1132   REF  10  LAST  576           27,2567   02511 0   STORE  W +72D            INITIALIZE DIAGONAL W VELOCITY
 1133   REF  11  LAST  577           27,2570   02521 0   STORE  W +80D
 1134   REF  12  LAST  577           27,2571   02531 1   STORE  W +88D
 1135                                27,2572   77616 0   RVQ
R1136
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P1137
R1138   CRS61.1  4/10/68
R1139     TO COMPUTE THE PREFERRED TRACKING ATTITUDE OF THE CSM WHICH ENABLES
R1140   OPTICS  TRACKING OF THE LM AND LM TRACKING OF THE CSM RADAR TRANSPONDER
R1141   AND TO COMPUTE THE X-AXIS TRACKING ATTITUDE OF THE CSM WHICH ENABLES
R11411  CGAS TRACKING OF THE LM.
R11412    TO PERFORM THE MANEUVER TO THE SELECTED TRACKING ATTITUDE IF THE
R11413  MANEUVER IS LESS THAN 10 DEGREES BUT TO CALL R60 IF THE MANEUVER IS
R11414  GREATER THAN 10 DEGREES OR IF THE R60FLAG IS SET.
R1142             (1) EXTRAPOLATE LM AND CSM STATE VECTORS TO PRESENT TIME USING
R1143                 CONIC EQUATIONS.

R1144             (2) CALCULATE LOS FROM CSM TO LM = RL - RC.

R1145             (3) THE PREFERRED TRACKING ATTITUDE IS DEFINED AS FOLLOWS:
R1146                 THE TRACK AXIS (I) IS ALIGNED ALONG THE LOS TO THE LM. THE
R1147                 TRACK AXIS (I) IS DEFINED AS:
R1148
R1149                 UNIT(I)=UNIT(Z   )COS55 &UNIT(X   )SIN55
R1150                           -SC              -SC
R1159             (4) COMPUTE DESIRED CDU ANGLES, USING VECPOINT.
R1169             (7) FORM DIFFERENCE BETWEEN DESIRED AND ACTUAL CDUS.
R1170                 IF ANY OF THE THREE ANGLE DIFFERENCES EXCEEDS 10 DEGREES,
R1171                 GROSS MANEUVER IS REQUIRED. SIGNAL R61 (SET MPAC=1) TO
R1172                 OPERATE KALCMANU AND EXIT CRS61.1.
R1173                 IF ALL DIFFERENCES ARE LESS THAN 10 DEGREES, CONTINUE.

R1174           (8) CALCULATE ORTHOGONAL LOS RATE IN REF COORDS AS

R1175                 OMEGATH = (UNITLOS(B1) X UNITDV(B1))(ABSDV(B7)/ABSLOS(B29))
R1176                 CONVERSION FACTOR OF 100/2PI (B4) REV CSEC PER RAD SEC IS
R1177                 APPLIED TO YIELD UNITS OF REVS/SEC. SCALE IS CARRIED AS
R1178                 B+1+1+7-29+4+1 PLUS RESULTS OF NORMALIZING ABSDV, ABSLOS.
R1179                 THE EXTRA B+1 RESULTS FROM RESCALING ABSDV B8 AFTER NORM
R1180                 TO AVOID OVFLOW ON DIVIDE.

R1181                 UNITLOS = UNIT( RL - RC) B1.
R1182                 UNITDV  = UNIT( VL - VC) B1.
R1183                 ABSLOS  = LENGTH OF LOS, METERS B29.
R1184                 ABSDV   = LENGTH OF DV , METERS/CSEC B7.

R1185           (9) OBTAIN RATE IN SM COORDS.

R1186                 OMEGATHSM = (REFSMMAT)(OMEGATH).

R1187           (10)OBTAIN GIMBAL ANGLE INCREMENTS FOR 0.1 SECOND.

R1188                 DTHETASM = (0.1)(OMEGATHSM)

R1189           (11)OBTAIN DELCDUX,Y,Z USING SUBR SMCDURES.
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R1190                INPUT CONSISTS OF

R1191                (A) VECTOR OF ANGULAR INCREMENTS, DTHETASM, STORED
R1192                    IN V(DTHETASM).

R1193                (B) SIN,COS CDUX,Y,Z FROM  SUBR CDUTRIG.

R1194                TRANSFER OUTPUT OF SMCDURES FROM V(DCDU) TO VAC14D.

R1195             (12)CALCULATE ANG LOS RATE IN BODY(NB) COORDS USING SUBR SMNB.

R1196                OMEGANB = (SMNB)(OMEGATHSM)

R1197                SUBR SMNB REQUIRES  OMEGATHSM IN V(VAC32D) AND ACTUAL CDUS
R1198                (Y,X,Z ORDER) IN V(VAC20D) WITH S1 OF VAC = BASE ADDRESS
R1199                OF CDUS (FIXLOC + 20D).

R1200             (13)CALCULATE ANG LOS RATE IN CONTROL COORDS AS FOLLOWS

R1201                WBODY = (MBODYTCTL)(OMEGANB)   UNITS=REVS/SEC(BO).

R1202                                ( 0.5       0              0       ) BODY TO
R1203                MBODYTCTL(B1) = (  0    COS(7.25)B1  -SIN(7.25)B1 )=CONTROL
R1204                                (  0    SIN(7.25)B1   COS(7.25)B1 ) AXES
R1205                                                                    CONVERSION
R1206                                                                     MATRIX

R1207             (14)RESCALE WBODY TO UNITS OF 450 DEG/SEC BY APPLYING FACTOR
R1208                OF 0.8 TO REVS/SEC.

R1209             (15)ADDRESS LIVE AUTOPILOT REGISTERS IN BASIC (UNDER INHINT).

R1210                    TRANSFER DESIRED CDUS, SCALED 180 DEGREES,FROM T(SAVEDCDU)
R1211                    TO V(CDUXD).
R1212                    TRANSFER DELCDUS, SCALED 180 DEG, FROM V(VAC14D)
R1213                    TO V(DELCDUX).
R1214                    TRANSFER OMEGA CONTROL, SCALED 450 DEG/SEC,FROM V(MPAC)
R1215                    TO V(WBODY).
R1216                    RELINT, SET MPAC=0, EXIT CRS61.1

R1217  CALL      L  CALL CRS61.1

R1218  RETURNS   ALL TO L+1.

R1219             (1) S(MPAC)=0. NORMAL EXIT. 3 SETS OF INPUTS FED TO DAP.
R1220             (2) S(MPAC)=1. CALCULATED DESIRED CDUS,SP, SET IN T(CPHI)
R1221                 FOR KALCMANU. ABS(ACDU - DCDU) EXCEEDS 10 DEGREES.
R1222             (3) S(MPAC)=2. GNCS AUTO MODE NOT SELECTED (BIT10=1).
R1223             (4) S(MPAC)=3. DAP HOLD FLAG (HOLDFLAG) NOT EQUAL -1.
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R1224   INPUT    (1) TIME2,TIME1. COMPUTER CLOCK TIME,DP, CENTISEC B28.
R1225            (2) CDUX,Y,Z. PRESENT CDU ANGLES,SP,2S COMPL HALF-REVS B0.
R1226            (3) M(REFSMMAT),STABLE MEMBER COORDS B1.

R1227   OUTPUT   NORMAL. EXIT WITH S(MPAC) = 0.

R1228            (1) CDUXD,CDUYD,CDUZD, DESIRED OUTER, INNER, MIDDLE CDU ANGLES,
R1229                DP, 1S COMPL, SCALED 180 DEGREES (HALF-REVS B0).
R1230            (2) DELCDUX,DELCDUY,DELCDUZ. 0.1 SEC CDU ANGULAR INCREMENTS,
R1231                DP, 1S COMPL, SCALED 180 DEG.
R1232            (3) WBODY,WBODY1,WBODY2. LOS ANGULAR RATE IN CONTROL COORDS,
R1233                DP, 1S COMPL, SCALED 450 DEG/SEC.

R1234            SPECIAL. EXIT WITH S(MPAC) = 1.

R1235            (1) CPHI,CTHETA,CPSI. DESIRED OUTER, INNER, MIDDLE CDU ANGLES,
R1236                SP, 2S COMPL, SCALED 180 DEGREES.

R1237   EXTERNAL SUBROUTINES USED   (B)=BASIC

R1238            (1) CALCGA     (5) LOADTIME(B)  (9) SMNB
R1239            (2) CDUTRIG    (6) MATMOVE
R1240            (3) CSMCONIC   (7) RDCDUS(B)
R1241            (4) LEMCONIC   (8) SMCDURES

R1242   ERASABLE (1) S(Q611),EBANK7  CRS61.1 EXIT .
R1243            (2) S(Q6111)EBANK7  CALCDCDU EXIT.
R1244            (3) T(SAVEDCDU) E6  SP VECTOR OF CDUDS.
R1245            (4) V(SAVEPOS)  E7  CSM POS VEC AND  D(SAVEPOS)= LENGTH OF LOS.
R1246            (5) V(SAVEVEL) E7  CSM VEL VEC.

R1247   FLAGWDS  HOLDFLAG. USED, NOT SET.

R1248   MISC     (1) ERASABLE ITEMP1 USED TO TEMP STORE EBANK UNDER INHINT.
R1249            (2) ERASABLE P21TIME USED AS TEMP STORE DURING CRS61.1
R1250            (3) ERAS DTHETASM USED AS TEMP STORE DURING EARLY CRS61.1

R1251   DEBRIS - CURRENT VAC AREA, CRS61.1 ERASABLES, ITEMP1, P21TIME

 1252                          24,2002                          BANK   24
 1253   REF   1                34,2000                          SETLOC P20S4
 1254                          34,3227                          BANK

 1255   REF   6  LAST  410     E6,1646                          EBANK= CDUXD
 1256   REF   1                                                 COUNT* $$/CRS61
A1257
 1258                          34,3227   40220 C  CRS61.1  STQ    SETPD
 1259   REF   2  LAST  122     34,3230   03704 1                  Q611
 1260                          34,3231   00001 C                  0
 1261                          34,3232   77634 0          RTB
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 1262   REF  16  LAST  568   34,3233   45505 C                  LOADTIME      LOAD CLOCK TIME2,1 INTO MPAC.
A1263
 1264   REF   8  LAST  449   34,3234   36316 C  STORT   STCALL  P21TIME      STORE CLOCK TIME FOR SUBR R63
 1265   REF   1               34,3235   71463 C                  R63           SUBR TO CALC DCDU(T=PRESENT,PASS1)
 1266                         34,3236   77751 1          TLOAD
 1267   REF  13  LAST  419   34,3237   01156 1                  THETAD        SAVE DCDU(T) FROM CALCDCDU FOR STEP4.
 1268   REF   2  LAST  112   34,3240   03373 C          STORE   SAVEDCDU
A1269
 1270                         34,3241   77776 1          EXIT
 12701  REF   1               34,3242   0 3263 C         TC      STEP2CK
 1271   REF   9  LAST  381   34,3243   3 4371 C  AUTOCK  CAF     PRIO30
 1272                         34,3244   0 0006 1         EXTEND
 1273   REF   3  LAST  537   34,3245   06 031 C         RXOR    CHAN31
 1274   REF   2  LAST  552   34,3246   7 7707 1         MASK    FURST3
 1275                         34,3247   0 0006 1         EXTEND                AUTO MODE SELECTED (BITS 15-13=011)
 1276   REF   1               34,3250   1 3252 C         BZF     DAPCK           YES-CONTINUE.
 1278   REF   1               34,3251   0 3256 C         TC      ASET

 1279   REF  13  LAST  560   34,3252   4 0075 1  DAPCK   CS      FLAGWRD1      IS STIKFLAG SET (I.E. IS SOMEONE ON RHC)
 1280   REF  37  LAST  557   34,3253   7 4675 C         MASK    BIT14
 1281   REF 144  LAST  563   34,3254   10 000 C         CCS     A
 1282   REF   1               34,3255   0 3322 1         TC      STEP3CK
 1283   REF 120  LAST  575   34,3256   3 4714 1  ASET    CAF     ZERO
 1284   REF 253  LAST  575   34,3257   54 154 C         TS      MPAC
 1285   REF  95  LAST  575   34,3260   0 6006 1         TC      INTPRET       EXIT CRS61.1
 1286                         34,3261    77650 1         GOTO
 1287   REF   3  LAST  580   34,3262    03704 1                 Q611

 1288   REF   9  LAST  437   34,3263   4 0101 C  STEP2CK  CS      FLAGWRD5      IS R60FLAG SET
 1289   REF  25  LAST  504   34,3264   7 4707 1         MASK    BIT4
 1290                         34,3265   0 0006 1         EXTEND
 1291   REF   1               34,3266   1 3454 C         BZF     MANUEXIS      YES, DO R60
 12911  REF 140  LAST  575   34,3267   0 4555 C         TC      BANKCALL
 12912  REF   2  LAST  194   34,3270    57721 1         CADR    UPACTOFF

 1292   REF  32  LAST  576   34,3271   3 4711 1         CAF     TWO           SET TEMPORARY INDEX DTHETASM = 2
 1293   REF   2  LAST  106   34,3272   55'611 1  CDULOOP  TS     DTHETASM
 1294   REF   3  LAST  581   34,3273   51'611 C         INDEX   DTHETASM
 1295   REF  12  LAST  561   34,3274   3 0032 C         CA      CDUX          SET A = ACTUAL CDU (ACDU).
 1296                         34,3275   0 0006 1         EXTEND
 1297   REF   4  LAST  581   34,3276   5 1611 C         INDEX   DTHETASM      SET INDEX TO ACCESS DESIRED CDU (DCDU).
 1298   REF  14  LAST  581   34,3277   21'155 C         MSU     THETAD        A = DIFF = ACDU - DCDU.
 1299   REF 254  LAST  581   34,3300   54 154 C         TS      MPAC          RETURN TO INTERPRETER FOR 10 DEGREE CK.
 1300   REF  96  LAST  581   34,3301   0 6006 1         TC      INTPRET       (OP APPROX SP CK FOR ROUGH CHECK)
 1301                         34,3302    45246 C         ABS     DSU
 1302   REF   1               34,3303    31552 1                 DEGREE10      IS (ACDU - DCDU) MORE THAN 10 DEGREES.
 1303                         34,3304    77444 C         BPL     EXIT          NO - OK, CONTINUE CHECKING OTHER ANGLES.
 1304   REF   1               34,3305    71311 1                 STKTEST       TEST STICK FLAG
 1305   REF   5  LAST  581   34,3306   11'611 1         CCS     DTHETASM      HAVE ALL 3 ANGLE DIFFS BEEN CHECKED.
 1306   REF   1               34,3307   0 3272 C         TC      CDULOOP       NO - DIM COUNT, CHECK NEXT ANGLE DIFF.
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 13061  REF    1                 34,3310  0 3243 1           TC      AUTOCK
 13062                            34,3311   77776 1  STKTEST  EXIT
 130625 REF   14  LAST  581       34,3312  4 0075 1           CS      FLAGWRD1
 13063  REF   38  LAST  581       34,3313  7 4675 0           MASK    BIT14
 130635 REF  145  LAST  581       34,3314  10 000 0           CCS     A
 13064  REF    2  LAST  581       34,3315  0 3454 1           TC      MANUEXIS        STIKFLAG IS NOT SET (OR R63)
 130645 REF   19  LAST  537       34,3316  3 4710 0           CAF     BIT3
 13065                            34,3317  0 0006 1           EXTEND                  STIKFLG IS SET
 130655 REF   21  LAST  379       34,3320  05 011 1           WOR     DSALMOUT        TURN ON UPACTY LIGHT

 130665 REF    2  LAST  581       34,3321  0 3256 0           TC      ASET            EXIT AND SET R61CNTR
 1307   REF   57  LAST  581       34,3322  0 6006 1  STEP3CK  TC      INTPRET
 1308                             34,3323   77601 0           SETPD
 1309                             34,3324   00001 0                   0             *
A1310                                                                               NOW HAVE DCDUS STORED IN T(SAVEDCDU).
A1311                                                                               GO CALC OTHER DAP INPUTS (DELCDU,WBODY)
 1312                             34,3325   52375 1  CRS61.2  VLOAD   VSU
 1313   REF    3  LAST  109       34,3326   03204 1                   DCDU
 1314   REF    2  LAST  123       34,3327   03715 1                   SAVEVEL         DV = VL - VC
 1315                             34,3330   57456 1           UNIT    VCOMP           V(MPAC)=-UNITDV.VAC36D=ABSDV.
 1316                             34,3331   74235 0           VXV     VXSC            (-UNITDV)CROSS(UNITLOS).
 1317   REF    2  LAST  122       34,3332   03707 1                   SAVEPOS
 1318   REF    1                 34,3333   31553 0                   RVCS/RDS        (UNITLOS B1)(UNITDV B1)(CONST B4)=CROSS.
 1319                             34,3334   77606 1           PUSH                    HOLD CROSS IN PUSHLIST0. SCALED B6.
 1320                             34,3335   60345 0           DLOAD   NORM            OBTAIN ABS VALUE OF LOS.
 1321   REF    9  LAST  581       34,3336   02316 1                   P21TIME         P21TIME IS TEMP STORE FOR ABSLOS.
 1322   REF   21  LAST  570       34,3337   00047 1                   X1
 1323                             34,3340   77606 1           PUSH                    NORM ABSLOS(DENOM) AND HOLD IN PUSH1.
A1324
 1325                             34,3341   60345 0           DLOAD   NORM
 1326                             34,3342   00045 0                   36D             NORM ABS VALUE OF DV(NUM).
 1327   REF    8  LAST  576       34,3343   00051 0                   S1
A1328
 1329                             34,3344   70460 1           XSU,1   SR1             X1 = X1(N DENOM)-S1(N NUM).
 1330   REF    9  LAST  582       34,3345   00050 1                   S1              SR1 TO AVOID OFLOW ON DDV.
 1331                             34,3346   74271 0           DDV     VXSC            ABSDV(MPAC)/ABSLOS(PUSH1) = QUOT.
 1332                             34,3347   77730 0           SXA,1                   QUOT(MPAC) X CROSS(PUSH0)
 1333   REF    2  LAST  122       34,3350   03705 0                   Q6111           SAVE SCALE OF RESULT (B-15,1X).
A1334                                                                               X1= NORM OF QUOT. QUOT SCALE B7-B29=B-22
A1335                                                                               CROSS IS SCALED B6. NEED SL1 TO RECOVER
A1336                                                                               SR1 SO THAT -22+6+1=-15. MPAC NOW HOLDS
A1337                                                                               ORTHO LOS RATE (OMEGA TH, B-15,X1).
 1338                             34,3351   76521 0           MXV     VSL1            OBTAIN RATE IN SM COORDS (OMEGTHSM) AND
 1339   REF   15  LAST  566       34,3352   01736 1                   REFSMMAT        ADJUST FOR REFSMMAT SCALE OF B1.
 1340                             34,3353   00025 0           STORE   20D             OMEGTHSM = VAC20D
A1341                                                                               DELTA THETA SM = OMEGTHSM * .1B-3.
 1342                             34,3354   77761 1           VXSC
 1343   REF    1                 34,3355   31555 0                   TENTH
 1344   REF    6  LAST  581       34,3356   03212 0           STORE   DTHETASM        STORE SM INCREM ANGLES FOR SMCDURES.
 1345                             34,3357   77624 1           CALL
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1346  REF  3  LAST  533   34,3360   47432 1            CDUTRIG   OBTAIN SIN,COSCDUS FOR SMCDURES.
1347                      34,3361   45001 1  SETPD     CALL      SMCDURES USES PUSH
1348                      34,3362   00001 C             0
1349  REF  1              34,3363   47675 C             SMCDURES  OBTAIN DELCDU IN V(DCDU).
1350                      34,3364   77750 C  LXA,1      Q6111     RELOAD X1
1351  REF  3  LAST  582   34,3365   03705 C             Q6111
1352                      34,3366   53775 1  VLOAD     VSL*      RECOVER SCALE.
1353  REF  4  LAST  582   34,3367   03204 1             DCDU      (B-15,X1) + TENTH(B-3) + HALFREVS(B1)
1354                      34,3370   20160 1             0 -17D,1  EQUALS B-17D,1 TO OBTAIN HALFREVS BD.
1355                      34,3371   00017 1  STORE     14D       HOLD DELS IN V(VAC14D) FOR AUTOPILOT.
A1356
1357                      34,3372   77624 1  CALL                CDMPUTES SINES AND COSINES FOR *SMNB*
1358  REF  4  LAST  583   34,3373   47432 1             CDUTRIG
1359                      34,3374   45175 C  VLOAD     CALL      LOAD VECTOR AND CALL TRANSFORMATION
1360                      34,3375   00025 C             20D       VECTOR FOR TRG*SMNB INTO MPAC
1361  REF  2  LAST  279   34,3376   47577 1             *SMNB*    OBTAIN ANG. RATE REFERRED TO NB (BODY)
1362                      34,3377   77721 C  MXV
1363  REF  2  LAST  535   34,3400   31561 1             MBDYTCTL  CONVERT RATE(OMEGA) TO CONTROL COORDS.
1364                      34,3401   77761 1  VXSC                MULT. BY 0.8 TO RESCALE REVS TO 450 DEG.
1365  REF  1              34,3402   15270 C             POINT8    RECOVER SCALE.
1366                      34,3403   53750 C  LXA,1      VSL*      RELOAD X1 TO RECOVER NORMALIZ.
1367  REF  4  LAST  583   34,3404   03705 C             Q6111     (B-15,X1) + MBDYTCTL(B1) = B-14D,1 TO
1368                      34,3405   20163 1             0 -14D,1  OBTAIN REVS SCALED AT 450 DEGREES.
A1369
1370                      34,3406    77776 1 CRS61.2A EXIT
1371                      34,3407  0 0004 C           INHINT
1372  REF 121  LAST  581  34,3410  3 4714 1           CAF       ZERO      TRANSFER DESIRED GIMBAL ANGLES
1373  REF   7  LAST  58C  34,3411  55'647 1           TS        CDUXD +1  FROM T(SAVEDCDU) TO V(CDUXD).
1374  REF   4  LAST  41C  34,3412  55'651 C           TS        CDUYD +1
1375  REF   4  LAST  41C  34,3413  55'653 1           TS        CDUZD +1
1376  REF   3  LAST  581  34,3414  3 1772 1           CA        SAVEDCDU
1377  REF   8  LAST  583  34,3415  55'646 C           TS        CDUXD
1378  REF   4  LAST  583  34,3416  3 1773 C           CA        SAVEDCDU +1
1379  REF   5  LAST  583  34,3417  55'650 1           TS        CDUYD
1380  REF   5  LAST  583  34,3420  3 1774 1           CA        SAVEDCDU +2
1381  REF   5  LAST  583  34,3421  55'652 C           TS        CDUZD
A1382
1383                      34,3422  0 0006 1           EXTEND              TRANSFER OMEGA CONTROL (ANG.LOS RATE)
1384  REF 255  LAST  581  34,3423  3 0155 C           DCA       MPAC      FROM V(MPAC) TO V(WBODY ).
1385  REF   9  LAST  409  34,3424  53'526 C           DXCH      WBODY
1386                      34,3425  0 0006 1           EXTEND
1387  REF 256  LAST  583  34,3426  3 0160 C           DCA       MPAC +3
1388  REF   4  LAST  409  34,3427  53'530 1           DXCH      WBODY1
1389                      34,3430  0 0006 1           EXTEND
1390  REF 257  LAST  583  34,3431  3 0162 1           DCA       MPAC +5
1391  REF   5  LAST  409  34,3432  53'532 C           DXCH      WBODY2
A1392
1393                      34,3433  0 0006 1           EXTEND              TRANSFER CDU INCREMENTS
1394  REF   9  LAST  535  34,3434  5 0120 1           INDEX     FIXLOC    FROM V(VAC14D) TO V(DELCDUX).
1395                      34,3435  3 0017 1           DCA       14D
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 1396  REF   5  LAST  409   34,3436  53'576 0            DXCH   DELCDUX
 1397                       34,3437  0 0006 1            EXTEND
 1398  REF  10  LAST  583   34,3440  5 0120 1            INDEX  FIXLOC
 1399                       34,3441  3 0021 1            DCA    16D
 1400  REF   4  LAST  409   34,3442  53'600 1            DXCH   DELCDUY
 1401                       34,3443  0 0006 1            EXTEND
 1402  REF  11  LAST  584   34,3444  5 0120 1            INDEX  FIXLOC
 1403                       34,3445  3 0023 0            DCA    18D
 1404  REF   4  LAST  409   34,3446  53'602 0            DXCH   DELCDUZ
 1405  REF  70  LAST  573   34,3447  4 4712 0            CS     ONE          NOW DAP VARIABLES LOADED. SET HOLDFLAG.
 1406  REF   5  LAST  552   34,3450  55'332 0            TS     HOLDFLAG     TO -1.
 1407                       34,3451  0 0003 1            RELINT
 1408  REF 122  LAST  583   34,3452  3 4714 1            CAF    ZERO         NORMAL RETURN (MPAC = 0)
 1409  REF   3  LAST  582   34,3453  0 3256 0            TC     ASET
 1410  REF  58  LAST  582   34,3454  0 6006 1  MANUEXIS  TC     INTPRET
 1411                       34,3455   77751 1  MANUEXIT  TLOAD
 1412  REF   6  LAST  583   34,3456   03373 0            SAVEDCDU     ENTER FROM STEP2. ACDU-DCDU EXCEEDS
 1413  REF   8  LAST  410   34,3457   01156 1            STORE  CPHI  10 DEG. STORE DCDU(T) IN CPHI,CTHETA,
 1414                       34,3460   52135 1            SLOAD  GOTO  CPSI FOR KALCMANU.
 1415  REF   1              34,3461   31603 0                   LOONE  SPECIAL RETURN (MPAC+0 = 1
 1416  REF   4  LAST  581   34,3462   03704 1                   Q611   OCTAL 00001
A1417
 1418                       34,3463   71220 1  R63       STQ    DLOAD        SUBR TO CALC DCDUS(T)
 1419  REF   5  LAST  583   34,3464   03705 0                   Q6111
 1420  REF  10  LAST  582   34,3465   02316 1                   P21TIME
 1421  REF  28  LAST  574   34,3466   34041 0            STCALL TDEC1
 1422  REF   4  LAST  553   34,3467   27045 0                   CSMCONIC
 1423                       34,3470   77775 1  HOLDATT   VLOAD              HOLD EXTRAPOLATED CSM POSITION AND
 1424  REF  18  LAST  553   34,3471   00001 0                   RATT         VELOCITY
 1425  REF   3  LAST  582   34,3472   27707 1            STOVL  SAVEPOS
 1426  REF  14  LAST  553   34,3473   00007 0                   VATT
 1427  REF   3  LAST  582   34,3474   03715 1            STORE  SAVEVEL
 1428                       34,3475   77745 1  CALCLEM   DLOAD              EXTRAPOLATE LEM STATE VECTOR TO SAME
 1429  REF  11  LAST  584   34,3476   02316 1                   P21TIME      TIME AS CSM USING LEMCONIC.
 1430  REF  29  LAST  584   34,3477   34041 0            STCALL TDEC1
 1431  REF   3  LAST  543   34,3500   27057 0                   LEMCONIC
 1432                       34,3501   77775 1            VLOAD
 1433  REF  15  LAST  584   34,3502   00007 0                   VATT
 1434  REF   5  LAST  583   34,3503   27204 1            STOVL  DCDU          STORE VATT IN DCDU TEMPORARILY
 1435  REF  19  LAST  584   34,3504   00001 0                   RATT         LOS = RL  RC
 1436                       34,3505   53451 1            VSU    UNIT
 1437  REF   4  LAST  584   34,3506   03707 1                   SAVEPOS
 1438  REF   5  LAST  584   34,3507   03707 1            STORE  SAVEPOS      SAVE UNITLOS FOR CRS61.2 RATE CALC.
 1439                       34,3510   76521 0            MXV    VSL1
 1440  REF  16  LAST  582   34,3511   01736 1                   REFSMMAT     CONVERT TO STABLE MEMBER
 1441  REF   3  LAST  385   34,3512   17357 0            STODL  POINTVSM
 1442                       34,3513   00045 0                   36D          HOLD ABS VAL OF LOS (VAC 36D)
 1443  REF  12  LAST  584   34,3514   02316 1            STORE  P21TIME      IN D(P21TIME) FOR CRS61.2 RATE CALC.
 1444                       34,3515   77775 1            VLOAD
 1445  REF   4  LAST   32   34,3516   15330 0                   UNITX
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1446  REF  11  LAST  387   34,3517  37351 1          STCALL  SCAXIS          TRACK AXIS UNIT VECTOR
1447  REF   3  LAST  381   34,3520  56126 1                  VECPOINT        FOR +X-AXIS TRACKING ATTITUDE
1448  REF   7  LAST  275   34,3521  01334 1          STORE   CPHIX           STORE ANGLES FOR N96 DISPLAY
1449                       34,3522  77775 1          VLOAD
1450  REF   1              34,3523  31544 0                  PRFUNIT
1451  REF  12  LAST  585   34,3524  37351 1          STCALL  SCAXIS
1452  REF   4  LAST  585   34,3525  56126 1                  VECPOINT
1453  REF   5  LAST  275   34,3526  03723 1          STORE   PRAXIS          STORE ANGLES FOR N95 DISPLAY
1454                       34,3527  77614 1          BOFF
1455  REF   4  LAST  550   34,3530  02745 0                  PRFTRKAT
1456  REF   1              34,3531  71535 1                  CRSTOR1
1457  REF  15  LAST  581   34,3532  01156 1  CRSTOR  STORE   THETAD          STORE ANGLES FOR N18 DISPLAY
1458                       34,3533  77650 1          GOTO
1459  REF   6  LAST  584   34,3534  03705 0                  Q6111
1460                       34,3535  77775 1  CRSTOR1 VLOAD
1461  REF   5  LAST  584   34,3536  15330 0                  UNITX
1462  REF  13  LAST  585   34,3537  03351 0          STORE   SCAXIS
1463                       34,3540  52151 0          TLOAD   GOTO
1464  REF   8  LAST  585   34,3541  01334 1                  CPHIX
1465  REF   1              34,3542  71532 0                  CRSTOR
1466                       34,3543  15066 0  PRFUNIT 2DEC    .40957602       55 DEG TRACK AXIS UNIT VECTOR
1466                       34,3544  17626 0
1467                       34,3545  00000 1          2DEC    0.0              FOR USE WITH VECPOINT
1467                       34,3546  00000 1
1468                       34,3547  11132 1          2DEC    .28678822
1468                       34,3550  27477 0
1469                       34,3551  01616 1  DEGREE10 DEC     .05556          10 DEG IN REVS                  STEP2
1470                       34,3552  37651 1  RVCS/RDS 2DEC    15.915494 B-4   100/2PI REV-CSEC/RAD-SEC.
1470                       34,3553  16721 1
1471                       34,3554  31463 1  TENTH    2DEC    .1 B+3          .1 B-3 (TO SCALE ANG.RATE TO .1 INREMS)
1471                       34,3555  06315 0
1474                       34,3556  20000 0  MAT1B1   2DEC    1.0 B-1
1474                       34,3557  00000 1
1475                       34,3560  20000 0  MBDYTCTL 2DEC    .5                              7.25 DEG NEGATIVE
1475                       34,3561  00000 1
1476                       34,3562  00000 1          2DEC    0                               X-AXIS ROTATION MATRIX
1476                       34,3563  00000 1
1477                       34,3564  00000 1          2DEC    0                               CONVERTS BODY TO CTL
1477                       34,3565  00000 1
1478                       34,3566  00000 1          2DEC    0                               AXES. SAME AS QUADROT
1478                       34,3567  00000 1
1479                       34,3570  17676 0          2DEC    .99200495 B-1   COS7.25 B1      BUT SCALED B1
1479                       34,3571  20113 0
1480                       34,3572  75766 1          2DEC    -.12619897 B-1  -SIN7.25 B1
1480                       34,3573  45544 0
1481                       34,3574  00000 1          2DEC    0
1481                       34,3575  00000 1
1482                       34,3576  02011 0          2DEC    .12619897 B-1   SIN7.25 B1
1482                       34,3577  32233 1
1483                       34,3600  17676 0          2DEC    .99200495 B-1   COS7.25 B1
1483                       34,3601  20113 0
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1484                        34,3602   00001 C  LOONE    OCT     00001          TO SET MPAC = 00001 FOR SPECIAL EXIT.
1485  REF  3 LAST 382         7707             FURST3   EQUALS  13,14,15      CONSTANT FOR AUTOCK (OCT 70000).
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R1486   ..... S22.1 ORBITAL NAVIGATION ROUTINE
R1487   MCC 1

R1488   FUNCTIONAL DESCRIPTION
R1489    1. UPDATE CSM STATE VECTOR
R1490    2. UPDATE LANDMARK POSITION
R1491    3. CONVERT W MATRIX FROM 9 TO 6 DIMENSIONS

R1492   SUBROUTINES CALLED
R1493    INTSTALL,INTEGRV,GETUM,SETRE,R-TO-TP,RP-TO-R,BVECTORS,INCORP1,INCORP2
R1494    LALOTORV,S22P241C,LAT-LONG,ROOT

R1495   ERASABLE INITIALIZATION
R1496    W=9X9 MATRIX
R1497    ORBWFLAG=0 FOR INVALID W MATRIX,=1 FOR VALID W MATRIX
R1498    ASTRONAUT ENTRY OF KNOWN,L,OFF
R1499    8NN= NUMBER OF MARKS  DECIMAL INTEGER B-14
R1500    REFSMMAT= TRANSFORMATION MATRIX
R1501    MARKSTAT= ADDRESS OF START OF MARK DATA (MARK DATA OF EACH MARK IS
R1502              STORED AS FOLLOWS,  TIME,AIG,SA,AMG,PA,AOG) TIME IS IN DOUBLE
R1503              PRECISION,ALL OTHERS ARE IN SINGLE PRECISION
R1504    CSM STATE VECTOR

R1505   OUTPUT
R1506    UPDATED CSM STATE VECTOR
R1507    UPDATED LANDMARK POSITION
R1508    NEW 6 DIMENSIONAL W MATRIX

R1509   DEBRIS
R1510    PUSH LIST,CSMPOS,ALPHAV,ERADN,UM,RCLP,LSTAR,VARIANCE,X789,BVECTOR,8KK,
R1511    S22LOC, SVMRKDAT TABLE,22SUBSCL,LANDMARK,CXOFF,S22C,LAT,LONG,ALT,
R1512    TEMPCP1,S22TOFF,S221OFF,CSPTEM1,S22ECRN,S22TPRIM

 1513                          13,2176                    BANK   13

 1514   REF   1                30,2000                    SETLOC P20S6
 1515                          30,2255                    BANK

 1516   REF  18  LAST  557     E5,1751                    EBANK= LANDMARK
 1517   REF   1                                           COUNT  35/LOCRB

 1518                          30,2255   66220 1  S22.1   STQ    SSP
 1519   REF   2  LAST  122     30,2256   03703 0          S22RTNEX
 1520   REF  10  LAST  582     30,2257   00051 0          S1
 1521                          30,2260   00006 1  DEC     6
 1522                          30,2261   66331 0  SSP     SSP             SET I=1  ITEM 8KK IS I
 1523   REF   2  LAST   94     30,2262   02747 1          8KK
 1524                          30,2263   00001 0  DEC     1
 1525   REF   2  LAST   94     30,2264   02751 0          S22LOC
 1526   REF   5  LAST  174     30,2265   03537 0  ECADR   SVMRKDAT        SET MARK DATA ADDRESS INTO S22LOC
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1527                                30,2266  76144 1            LXC,2  AXT,1
1528  REF  32 LAST 567              30,2267  01330 0                   MARKSTAT
1529                                30,2270  00044 1            DEC    36
1530                                30,2271  77773 1  S22.111   VLOAD*                 MOVE MARK DATA (5 SETS) FROM ADDR. IN
1531                                30,2272  77776 1                     0,2          MARKSTAT TO SVMRKDAT TABLE TO AVOID LOSS
1532  REF   6 LAST 587              30,2273  07604 1            STORE  SVMRKDAT +36D,1 IF RESTART OCCURS
1533                                30,2274  60114 0            INCR,2 TIX,1
1534                                30,2275  77771 0            DEC    -6
1535  REF   1                       30,2276  60271 0                   S22.111
1536                                30,2277  77414 0            SET    EXIT
15361 REF   2 LAST 553              30,2300  01464 0                   P22MKFLG             DOWNLINKED SVMRKDAT HOLDS PRESENT MARKS
1537  REF 141 LAST 581              30,2301  0 4555 0           TC     BANKCALL             RELEASE VAC AREA WHERE MARK DATA WAS
1538  REF   5 LAST 442              30,2302  16063 0            CADR   MKRELEAS
1539  REF   9 LAST 554              30,2303  0 5261 1           TC     2PHSCHNG
1540                                30,2304  00004 0            OCT    00004
1541                                30,2305  05022 1            OCT    05022
15411                               30,2306  13000 0            OCT    13000
1542  REF  99 LAST 584              30,2307  0 6006 1           TC     INTPRET
1543                                30,2310  43170 0            AXT,1  BOFF
1544                                30,2311  00000 1                   OD
1545  REF   8 LAST 576              30,2312  04343 1                   CMOONFLG             =0 EARTH,=1 MOON
1546  REF   1                       30,2313  60316 0                   S22SHIFT
1547                                30,2314  77710 1            INCR,1
1548                                30,2315  77775 1            DEC    -2
1549                                30,2316  40330 0  S22SHIFT SXA,1  SETPD
1550  REF   2 LAST 122              30,2317  03673 0                   S22ECRM              SET =0 EARTH,=-2 MOON FOR SHIFTING
1551                                30,2320  00001 0                   OD
1554                                30,2321  77624 1  FIG2EXIT CALL
1555  REF  15 LAST 574              30,2322  27371 1                   INTSTALL
1556                                30,2323  77624 1            CALL
1557  REF   1                       30,2324  61326 1                   S22FLGS
R1558                       FLOWCHART D=0   THEN DIMOFLAG=0  D6OR9FLG NOT TESTED
R1559                       FLOWCHART D=6   THEN DIMOFLAG=1  D6OR9FLG=0
R1560                       FLOWCHART D=9   THEN DIMOFLAG=1  D6OR9FLG=1

1561                                30,2325  43014 0            BOFF   CLRGO
1562  REF   3 LAST 568              30,2326  01751 0                   ORBWFLAG
1563  REF   1                       30,2327  60332 0                   SETWW5D              BRANCH TO SET W0-W5,ORBWFLAG,D
1564  REF   2 LAST 574              30,2330  01635 0                   D6OR9FLG             FLOWCHART D=6 PATH
1565  REF   1                       30,2331  60357 0                   SETVAND1
1566                                30,2332  77614 1  SETWW5D  CLEAR
1567  REF   6 LAST 574              30,2333  01676 1                   DIMOFLAG             FLOWCHART D=0 PATH
1568                                30,2334  66370 0            AXT,1  SSP
1569                                30,2335  00154 1            DEC    108
1570  REF  11 LAST 587              30,2336  00051 0                   S1
1571                                30,2337  00006 1            DEC    6
1572                                30,2340  77214 0            CLEAR  VLOAD
1573  REF   7 LAST 569              30,2341  02676 1                   RENDWFLG             GSOP CHANGE 8/18/67
1574  REF  12 LAST 576              30,2342  15332 1                   ZEROVECS
1575  REF  13 LAST 577              30,2343  06555 1  CLEARWW5 STORE  W +108D,1
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1576                          30,2344  67300 0          TIX,1  SLOAD
1577  REF   1                30,2345  60343 0                 CLEARWW5
1578  REF   1                30,2346  02005 0                 WORBPOS
1580  REF  14  LAST  588      30,2347  02401 0          STORE  W              SET DIAGONALS OF WO
1581  REF  15  LAST  589      30,2350  02411 1          STORE  W +8D
1582  REF  16  LAST  589      30,2351  02421 1          STORE  W +16D
1583                          30,2352  77735 0          SLOAD
1584  REF   1                30,2353  02006 0                 WORBVEL
1585  REF  17  LAST  589      30,2354  02511 0          STORE  W +72D         SET DIAGONALS OF W4
1586  REF  18  LAST  589      30,2355  02521 0          STORE  W +88D
1587  REF  19  LAST  589      30,2356  02531 1          STORE  W +88D
1588                          30,2357  77614 1  SETVANDI CLEAR
1589  REF   2  LAST  57C      30,2360  02666 0                 DMENFLG        0=6X6W, 1=9X9W
1590                          30,2361  77624 1  S22NXTIN CALL
1591  REF   1                30,2362  61322 0                 GETTF
1592  REF  30  LAST  584      30,2363  34041 0          STCALL TDEC1
1593  REF   8  LAST  571      30,2364  27113 1                 INTEGRV
1594                          30,2365  77624 1          CALL
1595  REF   1                30,2366  61273 0                 S22CALRC       CALC. RC  B-29 OR B-27 (CSMPOS)
1596                          30,2367  66150 0          LXA,1  SXA,1
1597  REF   3  LAST  587      30,2370  02750 1                 S22LOC         SETUP ADDR. OF MARK DATA FOR GETUM SUBR.
1598  REF   4  LAST  567      30,2371  01242 1                 MARKDATA
1599                          30,2372  77624 1          CALL                  COMPUTE UM
1600  REF   2  LAST  569      30,2373  47110 1  S2GETUM        GETUM
1601  REF   5  LAST  569      30,2374  01235 1          STORE  UM
1604                          30,2375  41535 1  DMPINTEG SLOAD  PUSH           TEST OFF=I
1605  REF   3  LAST  587      30,2376  02747 1                 8KK
1606                          30,2377  50535 1          SLOAD  SR3            OXOFF SCALED B-5, MUST MOVE TO B-14
1607  REF   3  LAST  556      30,2400  02746 0                 OXOFF          BEFORE SUBT.
1608                          30,2401  50442 0          SR3    SR3
1609                          30,2402  77625 0          DSU
1610                          30,2403  43030 0          BHIZ   BON
1611  REF   1                30,2404  60720 1                 S22OFF=I       BRANCH HERE IF OFF=I
1612  REF   3  LAST  589      30,2405  02706 1                 DMENFLG        0=6X6W, 1=9X9W
1613  REF   1                30,2406  60726 1                 S22D=9
16131                         30,2407  77624 1          CALL
16132 REF  12  LAST  572      30,2410  56712 0                 GRP2PC
1614                          30,2411  77614 1          SET
1615  REF   4  LAST  588      30,2412  01471 1                 ORBWFLAG
1616                          30,2413  43014 0          SET    SET
1617  REF   4  LAST  589      30,2414  02466 1                 DMENFLG        =0 ON FIRST PASS THRU HERE FOR D=0,OR6
1618  REF   1                30,2415  01062 1                 22DSPFLG       =1 TO DISPLAY DR,DV ON FIRST PASS
1619                          30,2416  43014 0          SET    BON
1620  REF   4  LAST  553      30,2417  00462 1                 ERADFLAG       =1 TO COMPUTE FISCHER RADIUS
1621  REF   6  LAST  557      30,2420  03307 0                 KNOWNFLG
1622  REF   1                30,2421  61070 1                 S22BCX22
1623                          30,2422  53575 0          VLOAD  UNIT           UNIT ALSO PUTS ABVAL(RC) IN 36D
1624  REF   5  LAST  572      30,2423  01207 0                 CSMPOS
1625  REF   4  LAST  556      30,2424  02152 0          STORE  ALPHAV         ALPHAV +4=SINL FOR SETRE
1626                          30,2425  43014 0          CLEAR  BOFF
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1627  REF   5  LAST  554   30,2426  01663 C                 LUNAFLAG
1628  REF   9  LAST  588   30,2427  04343 1                 CMOONFLG
1629  REF   1              30,2430  60433 C                 S22C=I
1630                       30,2431  77614 1          SET
1631  REF   6  LAST  59C   30,2432  01463 1                 LUNAFLAG
1632                       30,2433  77624 1  S22C=I  CALL                 ERADN= RO METERS B-29 BOTH EARTH/MOON
1633  REF   1              30,2434  26533 C                 SETRE
1634                       30,2435  77624 1          CALL                 COMPUTE RL FROM EQUATION 2.4.10
1635  REF   1              30,2436  61240 C                 S22F2410     STORED IN X789,MPAC  B-27,B-29
1636                       30,2437  70414 1          BOFF    VSR2         SCALE RL B-29 FOR BOTH EARTH/MOON
1637  REF  10  LAST  59C   30,2440  04343 1                 CMOONFLG
1638                       30,2441  60442 C                 +1
1639  REF   1              30,2442  02635 C          STORE   S22RL
1640                       30,2443  72441 C          DOT     SL1
1641  REF   6  LAST  589   30,2444  01235 1                 UM
1642  REF   1              30,2445  24037 C          STOVL   S22D         D= UM.RL B-29
1643  REF  13  LAST  588   30,2446  15332 1                 ZEROVECS
1644                       30,2447  41401 1          SETPD   PUSH
1645                       30,245C  00001 C                 0D
1646                       30,2451  65206 C          PUSH    PDDL         SET 0-18D = I BACKWARDS
1647  REF   5  LAST  55E   30,2452  15330 C                 HIDPHALF     PD 18
16471                      30,2453  77702 1          SR2                  B-3
1648                       30,2454  00005 1          STORE   4D
1649                       30,2455  00011 1          STORE   8D
1650                       30,2456  24015 C          STOVL   12D
1651  REF   7  LAST  59C   30,2457  01235 1                 UM           B-1
1652  REF   1              30,2460  24023 C          STOVL   S223X1
1653  REF   2  LAST  59C   30,2461  02635 C                 S22RL        B-29
1654                       30,2462  77624 1          CALL                 (UM)(RL T) B-30 STORED IN S22UMRL THRU
1655  REF   1              30,2463  61303 C                 S2231X13     S22UMRL +17D
1656                       30,2464  66370 C          AXT,1   SSP
1657                       30,2465  00022 1          DEC     18
1658  REF  12  LAST  588   30,2466  00051 C                 S1
1659                       30,2467  00006 1          DEC     6
1660                       30,2470  70573 1  S22NXTU VLOAD*  VSR2         (UM)(RL T) B-32
1661  REF   1              30,2471  03524 1                 S22UMRL +18D,1
16611                      30,2472  77741 C          V/SC
1662  REF   2  LAST  59C   30,2473  00037 C                 S22D         D B-29
1663                       30,2474  45445 C          BVSU    STADR        SUBTRACT FROM I B-3
1664  REF   2  LAST  59C   30,2475  70253 1          STORE   S22UMRL +18D,1  U MATRIX B-3
1665                       30,2476  76100 1          TIX,1   AXT,1         PD 0 AFTER TIX
1666  REF   1              30,2477  60470 1                 S22NXTU
1667                       30,2500  00044 1          DEC     36           S1 STILL 6 FROM ABOVE
1668                       30,2501  64373 1  S22NXTWI VLOAD*  MXV
1669  REF  20  LAST  589   30,2502  02445 C                 W +36D,1     B-19
1670  REF   3  LAST  59C   30,2503  03502 C                 S22UMRL      B-3
1671                       30,2504  77732 1          VSL3
1672  REF  21  LAST  59C   30,2505  06621 1          STORE   W +144D,1    W(I+18)= UW(I) B-19
1673                       30,2506  71300 1          TIX,1   DLOAD
1674  REF   1              30,2507  60501 C                 S22NXTWI
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1675  REF  1            30,2510  00041 1            S22RHO          B-28,B-30
1676                    30,2511  60414 0      BOFF  SR2             MAKE RHO B-30
1677  REF  11 LAST 590  30,2512  04343 1            CMOONFLG
1678                    30,2513  60514 1            +1
1679                    30,2514  57101 0      NORM  XAD,2
1680  REF  9  LAST 570  30,2515  00050 1            X2
1681  REF  10 LAST 591  30,2516  00047 1            X2
1682                    30,2517  41316 0      DSQ   DMP
1683  REF  1            30,2520  21650 1            SCTVAR          B+18
1684                    30,2521  77742 0      SR1                   ACCOUNTS FOR 1/2 IN NEXT FORMULA
1685  REF  2  LAST 591  30,2522  00041 1      STORE S22RHO          1/2(RHO SQ)(VARSCT)
1686                    30,2523  77770 1      AXT,1
1687                    30,2524  00022 1      DEC   18              S1 STILL 6 FROM ABOVE
1688                    30,2525  64373 1 S22NXXA VLOAD* MXV
1689  REF  4  LAST 590  30,2526  03524 1            S22UNRL +180,1  B-3
1690  REF  5  LAST 591  30,2527  03502 0            S22UNRL         B-3
1691                    30,2530  53761 1      VXSC  VSR*
1692  REF  3  LAST 591  30,2531  00041 1            S22RHO
1693                    30,2532  57212 1            0 -120,2        WITH VARRP SCALED B-28
1694  REF  1            30,2533  05301 0      STORE S22ULT +180,1   1/2(RHO SQ)(VARSCT)(U)(U T)
1695                    30,2534  77300 1      TIX,1 VLOAD
1696  REF  1            30,2535  60525 0            S22NXXA
1697  REF  6  LAST 590  30,2536  01235 1            UM
1698  REF  2  LAST 590  30,2537  34023 1      STCALL S223X1         UM ALSO IN MPAC FOR S2231X13 SUBR.
1699  REF  2  LAST 590  30,2540  61303 0            S2231X13        (UM)(UM T) B-2 IN S22UNRL,P17D
1700                    30,2541  50545 0      DLOAD SR3
1701  REF  2  LAST 86   30,2542  02241 1            ERADM           RO B-29
1702                    30,2543  63471 0      DDV   DSQ
1703  REF  3  LAST 590  30,2544  00037 0            S22D            B-29
1704                    30,2545  77605 1      DMP
1705  REF  1            30,2546  02010 1            RPVAR           ***** METERS SQ
1706  REF  4  LAST 591  30,2547  00041 1      STORE S22RHO          TEMP (VARRP)(RO/D)
1707                    30,2550  77770 1      AXT,1
1708                    30,2551  00022 1      DEC   18              S1 STILL 6 FROM ABOVE
1709                    30,2552  74373 0 S22NXXB VLOAD* VXSC
1710  REF  6  LAST 591  30,2553  03524 1            S22UNRL +180,1  (UM)(UM T) B-2
1711  REF  5  LAST 591  30,2554  00041 1            S22RHO
1712                    30,2555  77653 1      VAD*
1713  REF  2  LAST 591  30,2556  01301 1            S22ULT +180,1
1714  REF  3  LAST 591  30,2557  05301 0      STORE S22ULT +180,1   SMALL E MATRIX
1715                    30,2560  77775 1      VLOAD
1716  REF  14 LAST 590  30,2561  15332 1            ZEROVECS
1717  REF  22 LAST 590  30,2562  06643 0      STORE W +162D,1       CLEAR W8
1718                    30,2563  40100 1      TIX,1 BOV
1719  REF  1            30,2564  60552 0            S22NXXB
1720                    30,2565  60566 1            +1
1721                    30,2566  50145 1      DLOAD BMN
1722  REF  4  LAST 591  30,2567  01277 1            S22ULT +16D     E5
1723  REF  1            30,2570  60607 0            S22W76X
1724                    30,2571  53166 0      SQRT  BZE
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1725	REF	2	LAST	591	30,2572	60607	0			S22W76X	
1726	REF	23	LAST	591	30,2573	16625	1		STODL	W +148D	W74= SQ ROOT E5
1727	REF	5	LAST	591	30,2574	01275	0			S22ULT +14D	E4
1728					30,2575	40071	0		DDV	BOV	
1729	REF	24	LAST	592	30,2576	02625	1			W +148D	
1730	REF	1			30,2577	60601	0			S22W72X	
1731	REF	25	LAST	592	30,2600	02623	1		STORE	W +146D	W73= E4/W74
1732					30,2601	56345	0	S22W72X	DLOAD	DDV	
1733	REF	6	LAST	592	30,2602	01273	0			S22ULT +12D	E3
1734	REF	26	LAST	592	30,2603	02625	1			W +148D	
1735					30,2604	77600	1		BOV		
1736	REF	3	LAST	592	30,2605	60607	0			S22W76X	
1737	REF	27	LAST	592	30,2606	02621	0		STORE	W +144D	W72= E4/W74
1738					30,2607	63545	0	S22W76X	DLOAD	DSQ	
1739	REF	28	LAST	592	30,2610	02623	1			W +146D	W73
1740					30,2611	50021	1		BDSU	BMN	
1741	REF	7	LAST	592	30,2612	01267	0			S22ULT +8D	E2
1742	REF	1			30,2613	60627	1			S22W78X	
1743					30,2614	53166	0		SQRT	BZE	
1744	REF	2	LAST	592	30,2615	60627	1			S22W78X	
1745	REF	29	LAST	592	30,2616	16631	1		STODL	W +152D	W76= SQ ROOT (E2-W73 SQ)
1746	REF	30	LAST	592	30,2617	02621	0			W +144D	W72
1747					30,2620	44205	0		DMP	BDSU	
1748	REF	31	LAST	592	30,2621	02623	1			W +146D	W73
1749	REF	8	LAST	592	30,2622	01265	1			S22ULT +6D	E1
1750					30,2623	40071	0		DDV	BOV	
1751	REF	32	LAST	592	30,2624	02631	1			W +152D	W76
1752	REF	3	LAST	592	30,2625	60627	1			S22W78X	
1753	REF	33	LAST	592	30,2626	02627	0		STORE	W +150D	W75= (E1-W72W73)/W76
1754					30,2627	63545	0	S22W78X	DLOAD	DSQ	
1755	REF	34	LAST	592	30,2630	02627	0			W +150D	
1756					30,2631	63525	0		PDDL	DSQ	
1757	REF	35	LAST	592	30,2632	02621	0			W +144D	W72
1758					30,2633	77615	0		DAD		
1759					30,2634	50021	1		BDSU	BMN	
1760	REF	9	LAST	592	30,2635	01257	0			S22UUT	E0
1761	REF	1			30,2636	60641	1			S22SCLW	
1762					30,2637	77766	0		SQRT		
1763	REF	36	LAST	592	30,2640	02635	0		STORE	W +156D	W78= SQ RT(E0-W72 SQ-W75 SQ)
1764					30,2641	74575	0	S22SCLW	VLOAD	VSR1	SCALE W8 METERS B-19
1765	REF	37	LAST	592	30,2642	02621	0			W +144D	
1766	REF	38	LAST	592	30,2643	26621	0		STOVL	W +144D	
1767	REF	39	LAST	592	30,2644	02627	0			W +150D	
1768					30,2645	77762	1		VSR1		
1769	REF	40	LAST	592	30,2646	26627	0		STOVL	W +150D	
1770	REF	41	LAST	592	30,2647	02635	0			W +156D	
1771					30,2650	77762	1		VSR1		
1772	REF	42	LAST	592	30,2651	02635	0		STORE	W +156D	
1773					30,2652	77624	1	S22SAVET	CALL		
1774	REF	2	LAST	589	30,2653	61322	0			GETTF	

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1775  REF   2  LAST  122   30,2654   03672 1          STORE   S22TPRIM        SAVE PRESENT TIME FOR PIOS
1776                       30,2655   77776 1  S22I=N  EXIT                    TEST I=N
1777  REF  31  LAST  574   30,2656   0 5301 C         TC      PHASCHNG
1778                       30,2657   04022 C          OCT     04022
1779  REF   4  LAST  589   30,2660   4 1746 1         CS      8KK
1780  REF   4  LAST  559   30,2661   6 1747 1         AD      8NN
1781                       30,2662   0 0006 1         EXTEND
1782  REF   1              30,2663   6 3126 1         BZMF    S22F244X        EXIT TO FIGURE 2.4-4
1783  REF   5  LAST  593   30,2664   3 1746 C         CA      8KK             I=I+1
1784  REF  71  LAST  584   30,2665   6 4712 1         AD      ONE
1785  REF   6  LAST  573   30,2666   55'300 1         TS      TEMPCR1
1786  REF   4  LAST  589   30,2667   3 1750 1         CA      S22LCC          ADD 7 TO LCC TO GET ADDR. OF NEXT MARK
1787  REF  11  LAST  558   30,2670   6 4716 C         AD      SEVEN
1788  REF   7  LAST  593   30,2671   55'301 C         TS      TEMPCR1 +1
1789  REF  32  LAST  593   30,2672   0 5301 C         TC      PHASCHNG
1790                       30,2673   04022 C          OCT     04022
1791  REF   8  LAST  593   30,2674   3 1300 C         CA      TEMPCR1
1792  REF   6  LAST  593   30,2675   55'746 1         TS      8KK
1793  REF   9  LAST  593   30,2676   3 1301 1         CA      TEMPCR1 +1
1794  REF   5  LAST  593   30,2677   55'750 C         TS      S22LCC
1795  REF 100  LAST  588   30,2700   0 6006 1         TC      INTPRET
1796                       30,2701   77624 1          CALL                    FOR ALL INTEGRATIONS OTHER THAN FIRST
1797  REF  16  LAST  588   30,2702   27371 1  S2INTS1         INTSTALL
1798                       30,2703   77624 1          CALL
1799  REF   2  LAST  588   30,2704   61326 1                  S22FLGS
1800                       30,2705   43014 C          BON     CLEAR
1801  REF   5  LAST  589   30,2706   02706 1                  DMENFLG
1802  REF   1              30,2707   60361 C                  S22NXTIN        RETURN ALWAYS EXCEPT OFFSET POINT MARK 1
1803  REF   7  LAST  588   30,2710   01676 1                  DIMOFLAG
1804                       30,2711   43014 C          BOFF    SET
1805  REF   5  LAST  589   30,2712   01751 C                  DRBWFLAG
1806  REF   2  LAST  593   30,2713   60361 C                   S22NXTIN       OFFSET POINT MARK 1,NO W INTEGRATION
1807  REF   8  LAST  593   30,2714   01476 C                  DIMOFLAG
1808                       30,2715   77614 1          CLRGO
1809  REF   3  LAST  588   30,2716   01635 C                  D6OR9FLG
1810  REF   3  LAST  593   30,2717   60361 C                  S22NXTIN        OFFSET POINT MARK 1,INTEGRATE W 6X6
1811                       30,2720   77624 1  S22OFF=I CALL
1812  REF   3  LAST  592   30,2721   61322 C                  GETTF
1813  REF   9  LAST  556   30,2722   27670 C          STOVL   S22TOFF         TIME SUB OFF
1814  REF   9  LAST  591   30,2723   01235 1                  UM
1815  REF   1              30,2724   35215 1          STCALL  S22UOFF         U SUB OFF
1816  REF   1              30,2725   60655 1                  S22I=N          TEST I=N
1817                       30,2726   77775 1  S22D=9  VLOAD                   D=9 PATH
1818  REF   1              30,2727   01701 C                  X789
1819                       30,2730   14001 C          STODL   OD              CALL PIOS TWICE TO TRANSFORM RL TO TIME
1820  REF   3  LAST  593   30,2731   03672 1                  S22TPRIM        T(SUB F) FROM TIME T PRIME
1821                       30,2732   00007 C          STORE   6D
1822                       30,2733   45135 1          SLOAD   CALL
1823  REF   3  LAST  588   30,2734   03674 1                  S22ECRM         0=EARTH,NON-ZERO=MOON
1824  REF   1              30,2735   55366 1  S2RTRP          R-TO-RP
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1825                                30,2736  45006 C                PUSH    CALL      R-TO-RP LEAVES PUSHLOC AT Q
1826  REF   4  LAST  593           30,2737  61322 C                        GETTF
1827                                30,2740  00007 C                STORE   6D
1828                                30,2741  45135 1                SLOAD   CALL
1829  REF   4  LAST  593           30,2742  03674 1                        S22ECRM
1830  REF   2  LAST  556           30,2743  55341 1  S2RPTR                RP-TC-R
1831  REF   2  LAST  593           30,2744  01701 C  S22BCX32      STORE   X789
1832                                30,2745  40014 C                SET     BOV
1833  REF   7  LAST  571           30,2746  02464 C                        INCORFLG  FLAG=1
1834                                30,2747  60750 C                        +1        CLEAR OVERFLOW
1835                                30,2750  77651 C                VSU
1836  REF   6  LAST  589           30,2751  01207 C                        CSMPOS
1837  REF   7  LAST  571           30,2752  03531 C                STORE   RCLP      RCL=RL-RC
1838                                30,2753  47256 C                UNIT    VXV       USTAR=UNIT(UNIT(RCL)XUM)
1839  REF  10  LAST  593           30,2754  01235 1                        UM
1840                                30,2755  40056 C                UNIT    BOV
1841  REF   1                     30,2756  60652 C                        S22SAVET  COMPUTATION OVERFLOW,SAVE TF
1842  REF   5  LAST  569           30,2757  01245 C                STORE   USTAR
1843                                30,2760  43014 C  S22BCX12      SET     SET
1844  REF   6  LAST  593           30,2761  02466 1                        DMENFLG   =1 FOR 9X9 M
1845  REF  11  LAST  576           30,2762  00467 1                        VEHUPFLG  =1 FOR CSM
1846                                30,2763  43345 1                DLOAD   DAD
1847  REF   2  LAST  591           30,2764  21650 1                        SCTVAR    B+18
1848  REF   1                     30,2765  21652 C                        IMUVARR    B+18
1849  REF   8  LAST  570           30,2766  27526 C                STOVL   VARIANCE
1850  REF   8  LAST  594           30,2767  03531 C                        RCLP       B-29 OR B-27
1851                                30,2770  60246 1                ABVAL   NORM
1852  REF  22  LAST  582           30,2771  00047 1                        X1
1853                                30,2772  41316 C                DSQ     DMP
1854  REF   9  LAST  594           30,2773  03526 C                        VARIANCE
1855                                30,2774  56070 C                XAD,1   XAD,1
1856  REF  23  LAST  594           30,2775  00046 C                        X1        DOUBLE NORM SHIFT SINCE RCLP WAS SQUARED
1857  REF   5  LAST  594           30,2776  03673 C                        S22ECRM   DOUBLE EARTH OR MOON SHIFT,SAME REASON
1858                                30,2777  53670 C                XAD,1   SR*
1859  REF   6  LAST  594           30,3000  03673 C                        S22ECRM
1860                                30,3001  20601 1                        0,1       SCALE VARIANCE B-40 FOR BOTH EARTH,MOON
1861                                30,3002  77751 1                TLOAD             CHANGE MODE TO TRIPLE
1862  REF 258  LAST  583           30,3003  00155 C                        MPAC
1863  REF  10  LAST  594           30,3004  37526 1                STCALL  VARIANCE  CALC B0,B1,DELTAQ, NEW USTAR
1864  REF   2  LAST  569           30,3005  47047 1  S2BVTRS               BVECTORS
1865                                30,3006  57575 1                VLOAD   VCOMP
1866  REF  14  LAST  572           30,3007  03502 C                        BVECTOR
1867  REF  15  LAST  594           30,3010  37516 1                STCALL  BVECTOR +12D  B2=-B0
1868  REF   2  LAST  570           30,3011  75250 1  S2INCP1               INCORP1
1869                                30,3012  77624 1                CALL
1870  REF  13  LAST  589           30,3013  56712 C                        GRP2PC
1871                                30,3014  43014 C                BOFF    CLEAR
1872  REF   2  LAST  589           30,3015  01342 C                        22DSPFLG  =1 DISPLAY DELTA R,V  =0 DO NOT
1873  REF   1                     30,3016  61047 C                        S22BCX42
1874  REF   3  LAST  594           30,3017  01262 C                        22DSPFLG
```

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18741                                  30,3020   77624 1            CALL
18742  REF  14  LAST  594              30,3021   56712 C                 GRP2PC
1875                                   30,3022   51575 1            VLOAD  ABVAL
1876   REF   7  LAST  57C              30,3023   01257 C                 DELTAX          DELTA R
1877                                   30,3024   53750 C            LXA,1  SR*
1878   REF   7  LAST  594              30,3025   03673 C                 S22ECRM         SCALE DELTA R ALWAYS METERS B-29
1879                                   30,3026   20601 1                 0,1
1880   REF   9  LAST  573              30,3027   27502 C            STOVL  N49DISP
1881   REF   8  LAST  595              30,3030   01265 1                 DELTAX +6       DELTA V
1882                                   30,3031   53646 C            ABVAL  SR*              DELTA V=METERS/CSEC B-7 ALWAYS
1883                                   30,3032   20601 1                 0,1
1884   REF  10  LAST  595              30,3033   03504 C            STORE  N49DISP +2
1885                                   30,3034   77776 1            EXIT
1886   REF   1                         30,3035  3 3655 1            CAF    V06N49EE
1887   REF 142  LAST  588              30,3036  0 4555 C            TC     BANKCALL
1888   REF   9  LAST  555              30,3037    20763 1           CADR   GOFLASHR
1889   REF  26  LAST  559              30,3040  0 4106 1            TC     GOTOPOOH        V34E TERMINATE
1890                                   30,3041  0 3046 C            TC     +5              INCORPORATE CHANGES
1891   REF   1                         30,3042  0 3230 C            TC     S22EXEX         V32E RECYCLE
1892   REF  20  LAST  582              30,3043  3 4710 C            CAF    BIT3
1893   REF  11  LAST  559              30,3044  0 5415 1            TC     BLANKET
1894   REF  15  LAST  573              30,3045  0 5112 C            TC     ENDOFJOB
1895   REF 101  LAST  593              30,3046  0 6006 1            TC     INTPRET
1896                                   30,3047   77624 1  S22BOX42  CALL
1897   REF   2  LAST  571              30,3050   75460 1                 INCORP2
1898                                   30,3051   77624 1       CALL                      CSMPOS=RC B-29 OR B-27
1899   REF   2  LAST  589              30,3052   61273 C                 S22CALRC
1902                                   30,3053   77414 C  DMPINCP2 BOFF  EXIT
1903   REF   8  LAST  594              30,3054   02744 1                 INCORFLG
1904   REF   2  LAST  594              30,3055   60652 C                 S22SAVET        SAVE TF AND TEST I=N
1905   REF  33  LAST  593              30,3056  0 5301 C       TC       PHASCHNG
1906                                   30,3057   04022 C       OCT      04022
1907   REF 102  LAST  595              30,3060  0 6006 1       TC       INTPRET
1908                                   30,3061   77214 C       CLEAR    VLOAD
1909   REF   9  LAST  595              30,3062   02664 1                 INCORFLG        FLAG=0
1910   REF   3  LAST  594              30,3063   01701 C                 X789
1911                                   30,3064   77651 C       VSU
1912   REF   7  LAST  594              30,3065   01207 C                 CSMPOS
1913   REF   9  LAST  594              30,3066   37531 1       STCALL   RCLP            RCL=RL-RC
1914   REF   1                         30,3067   60760 C                 S22BOX12
1915                                   30,3070   66370 C  S22BOX22 AXT,1  SSP           CLEAR W6,W7,W8  (27 ELEMENTS 54 REGS)
1916                                   30,3071   00066 1       DEC      54
1917   REF  13  LAST  590              30,3072   00051 C                 S1
1918                                   30,3073   00006 1       DEC      6
1919                                   30,3074   77775 1       VLOAD
1920   REF  15  LAST  591              30,3075   15332 1                 ZEROVECS
1921   REF  43  LAST  592              30,3076   06643 C  CLRW678  STORE  W +1620,1
1922                                   30,3077   67300 C       TIX,1    SLOAD
1923   REF   1                         30,3100   61076 1                 CLRW678
1924   REF   1                         30,3101   02007 1                 S22WSUBL
```

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1926  REF  44  LAST  595  30,3102  02621 C            STORE  W +144D
1927  REF  45  LAST  596  30,3103  02631 1            STORE  W +152D
1928  REF  46  LAST  596  30,3104  02641 C            STORE  W +160D
1929                      30,3105  43014 C            CLEAR  BOFF          SET LUNAFLAG, TIME FOR LALOTORV
1930  REF   7  LAST  590  30,3106  01663 C                   LUNAFLAG       ERADFLAG,LAT,LONG,ALT SET PREVIOUSLY
1931  REF  12  LAST  591  30,3107  04343 1                   CMOONFLG       CHECK SCALING OF ITEMS,ALT INPUT AND
1932  REF   1             30,3110  61113 C                   S22BX22A       RL OUTPUT IN ALPHAV BOTH B-29
1933                      30,3111  77614 1            SET
1934  REF   8  LAST  596  30,3112  01463 1                   LUNAFLAG
1935                      30,3113  77624 1  S22BX22A  CALL
1936  REF   5  LAST  594  30,3114  61322 C                   GETTF
1937                      30,3115  77624 1            CALL                 COMPUTE RL
1938  REF   2  LAST  526  30,3116  26373 1                   LALOTORV
1939                      30,3117  43175 C            VLOAD  BOFF
1940  REF   5  LAST  589  30,3120  02152 C                   ALPHAV         RL B-29
1941  REF  13  LAST  596  30,3121  04343 1                   CMOONFLG
1942  REF   1             30,3122  61124 1                   S22BX22B
1943                      30,3123  77752 1            VSL2                 SCALE RL B-27 FOR MOON
1944                      30,3124  77650 1  S22BX22B  GOTO
1945  REF   1             30,3125  60744 C                   S22BCX32
1946  REF 103  LAST  595  30,3126  0 6006 1  S22F244X TC     INTPRET
1947                      30,3127  46135 1  S22F244   SLOAD  BHIZ           FIG 2.4-4   TEST OFF=0
1948  REF   4  LAST  589  30,3130  02746 C                   CXOFF
1949  REF   1             30,3131  61160 1                   S22BCX44
1950                      30,3132  77776 1            EXIT
1951  REF  34  LAST  595  30,3133  0 5301 C            TC     PHASCHNG
1952                      30,3134  04022 C            OCT    04022
1953  REF 104  LAST  596  30,3135  0 6006 1            TC     INTPRET
1954                      30,3136  77745 1            DLOAD
1955  REF  10  LAST  593  30,3137  03670 C                   S22TOFF
1956  REF  31  LAST  589  30,3140  34041 C            STCALL TDEC1          CALC RC AT OFFSET TIME
1957  REF   4  LAST  521  30,3141  27022 1                   CSMPREC
1958                      30,3142  77775 1            VLOAD
1959  REF   5  LAST  501  30,3143  00017 1                   RATT1          RC METERS B-29 OR B-27
1960  REF   8  LAST  595  30,3144  25207 C            STOVL  CSMPCS
1961  REF   2  LAST  593  30,3145  01215 0                   S22UOFF
1962  REF  11  LAST  594  30,3146  25235 1            STOVL  UM             U=UOFF
1963  REF   4  LAST  595  30,3147  01701 C                   X789
1964                      30,3150  43046 1            ABVAL  BOFF
1965  REF  14  LAST  596  30,3151  04343 1                   CMOONFLG
1966                      30,3152  61154 C                   +2
1967                      30,3153  77702 1            SR2                  SCALE MOON RO B-29 FOR S22F2410 SUBR
1968  REF   3  LAST  591  30,3154  36241 C            STCALL ERADN
1969  REF   2  LAST  590  30,3155  61240 C                   S22F2410
1970                      30,3156  77650 1            GOTO
1971  REF   1             30,3157  61163 1                   S22BX44A
1972                      30,3160  77624 1  S22BCX44 CALL
1973  REF   6  LAST  596  30,3161  61322 C                   GETTF
1974  REF  11  LAST  596  30,3162  03670 C            STORE  S22TOFF        PRESENT TIME FOR LAT-LONG SETUP
1975                      30,3163  77214 C  S22BX44A CLEAR  VLOAD
```

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1976  REF   9  LAST  596   30,3164   01663 0                    LUNAFLAG
1977  REF   5  LAST  596   30,3165   01701 0                    X789
1978                       30,3166   43014 0           BOFF     SET
1979  REF  15  LAST  596   30,3167   04343 1                    CMOONFLG
1980  REF   1               30,3170   61173 0                    S22BX44B
1981  REF  10  LAST  597   30,3171   01463 1                    LUNAFLAG       SET = 1 FOR LAT-LONG
1982                       30,3172   77742 0           VSR2                    SCALE RL MOON B-29 FOR LAT-LONG
1983  REF   6  LAST  596   30,3173   16152 0  S22BX44B STODL    ALPHAV         RL SCALED B-29 FOR LAT-LONG
1984  REF  12  LAST  596   30,3174   03670 0                    S22TOFF        EITHER PRESENT OR OFFSET TIME
1985                       30,3175   77624 1           CALL
1986  REF   3  LAST  556   30,3176   26322 0                    LAT-LONG       **** ALT OUTPUT ALWAYS B-29
1989                       30,3177   77624 1           CALL                    DISPLAY LAT/LONG/ALT
1990  REF   1               30,3200   61336 0                    LLASRD
1991                       30,3201   77776 1           EXIT
1992  REF   2  LAST  556   30,3202   3 3656 1          CAF      V06N89B
1993  REF 143  LAST  595   30,3203   0 4555 0          TC       BANKCALL
1994  REF  19  LAST  556   30,3204    20624 0          CADR     GOFLASH
1995  REF   1               30,3205   0 3233 0          TC       S22GTP         V34E TERMINATE
1996                       30,3206   0 3210 1          TC       +2             PROCEED   SAVE LANDING SITE COORD
1997  REF   1               30,3207   0 3224 0          TC       S22.981X       RECYCLE   POINT A IN GSOP
1998  REF 105  LAST  596   30,3210   0 6006 1          TC       INTPRET
1999                       30,3211    70740 0          LXC,1    DLOAD*
2000  REF   6  LAST  593   30,3212    02750 1                    S22LCC
2001                       30,3213    00001 0                    0,1
2002                       30,3214    24007 0           STOVL    6D             6-7D= LANDING SITE TIME FOR R-TO-RP
2003  REF   6  LAST  597   30,3215    01701 0                    X789
2004                       30,3216    00001 0           STORE    0D             0-5D= LANDING SITE VEC  FOR R-TO-RP
2005                       30,3217    45135 1           SLOAD    CALL
2006  REF   6  LAST  590   30,3220    15330 0                    HIDPHALF       ANY NON-ZERO FOR MOON
2007  REF   2  LAST  593   30,3221    55366 1                    R-TO-RP        CONVERT RLS TO MOON-FIXED COORD
2008  REF   6  LAST  556   30,3222    02026 1           STORE    RLS            LANDING SITE VECTOR
2009                       30,3223    77776 1           EXIT
2010  REF 106  LAST  597   30,3224   0 6006 1  S22.981X TC       INTPRET
2011                       30,3225    77624 1           CALL
2012  REF   1               30,3226    61354 1                    9DWTC6DW
20121                      30,3227    77776 1           EXIT                    GO TO POINT A IN CHAPTER 5
20122 REF 107  LAST  597   30,3230   0 6006 1  S22EXEX  TC       INTPRET        WITHOUT CONVERTING W
2013                       30,3231    77650 1           GOTO
2014  REF   3  LAST  587   30,3232    03703 0                    S22RTNEX

20141 REF 108  LAST  597   30,3233   0 6006 1  S22GTP   TC       INTPRET        CONVERT W BEFORE TO GOTOPOOH
20142                      30,3234    77624 1           CALL
20143 REF   2  LAST  597   30,3235    61354 1                    9DWTC6DW
20144                      30,3236    77776 1           EXIT
20145 REF  27  LAST  595   30,3237   0 4106 1          TC       GOTOPOOH
2015                       30,3240    77201 1  S22F2410 SETPD    VLOAD          COMPUTE FORMULA 2.4.10
2016                       30,3241    00001 0                    0D
2017  REF   9  LAST  596   30,3242    01207 0                    CSMPOS         RC B-29 EARTH,B-27 MOON
2018                       30,3243    50256 0           UNIT     DOT            UNIT ALSO SETS 36D=ABVAL(RC) USED BELOW
2019  REF  12  LAST  596   30,3244    01235 1                    UM
```

```
2020                          30,3245  57552 1          SL1      DCOMP     GSOP CHANGE 8/18/67
2021                          30,3246  77606 1          PUSH               PD 20 OD=COSA=-(UM.RC)/ABVAL(RC) B-1
2022                          30,3247  44316 0          DSQ      BDSU
2023  REF   1                 30,3250  21654 0                   DEC1B2
2024                          30,3251  43125 0          PDDL     BOFF      PD 40  20=1-COSA SQ=SINA SQ  B-2
2025  REF   4  LAST  596      30,3252  02241 1                   ERADM     RO ALWAYS B-29 FROM SETRE
2026  REF  16  LAST  597      30,3253  04343 1                   CMOONFLG
2027                          30,3254  61256 1                   +2
2028                          30,3255  77712 0          SL2                SCALE RO B-27 FOR MOON
2029                          30,3256  56362 0          SR1R     DDV       (RO/RC) B-1
2030                          30,3257  00045 0                   36D
2031                          30,3260  45316 1          DSQ      DSU       PD 20 (RO/RC) SQ - SINA SQ  B-2
2032                          30,3261  44366 1          SQRT     BDSU      PD OD COSA-SQRT((RO/RC)SQ-SINA SQ) B-1
2033                          30,3262  77605 1          DMP                DMP RESULT B-28 MOON,B-30 EARTH
2034                          30,3263  00045 0                   36D       VXSC RESULT B-29 MOON, B-31 EARTH
2035  REF   6  LAST  591      30,3264  00041 1          STORE    S22RHO    RHO FOR W INIT. OF UNKNOWN LMK B-28,B-30
2036                          30,3265  77761 1          VXSC
2037  REF  13  LAST  597      30,3266  01235 1                   UM
2038                          30,3267  53352 0          VSL2     VAD       SCALE B-27 MOON,B-29 EARTH AND ADD RC
2039  REF  10  LAST  597      30,3270  01207 0                   CSMPCS
2040  REF   7  LAST  597      30,3271  01701 0          STORE    X789
2041                          30,3272  77616 0          RVQ                B-27 FOR EARTH OR B-29 FOR MOON
2042                          30,3273  77350 1  S22CALRC LXA,1    VLOAD     COMPUTE RC B-29 OR B-27
2043  REF   8  LAST  595      30,3274  03673 0                   S22ECRM   =0 FOR EARTH,-2 FOR MOON
2044  REF   2  LAST  572      30,3275  01573 1                   DELTACSM
2045                          30,3276  53257 1          VSR*     VAD
2046                          30,3277  20610 1                   7,1
2047  REF   2  LAST  572      30,3300  01607 1                   RCVCSM
2048  REF  11  LAST  598      30,3301  01207 0          STORE    CSMPCS
2049                          30,3302  77616 0          RVQ
2050  REF   1                 30,3303  00031 0  S2231X13 STORE    S221X3    MULT 3X1 BY 1X3,STORE RESULTING 3X3 IN
2051                          30,3304  77131 1          SSP      AXT,2     S22UNRL- S22UNRL +17D
2052  REF   7  LAST  526      30,3305  00052 0                   S2
2053                          30,3306  00002 0          DEC      2
2054                          30,3307  00006 1          DEC      6
2055                          30,3310  77770 1          AXT,1
2056                          30,3311  00022 1          DEC      18
2057                          30,3312  73775 0  S2231NXT VLOAD    VXSC*
2058  REF   2  LAST  598      30,3313  00031 0                   S221X3
2059  REF   3  LAST  591      30,3314  77746 1                   S223X1 +6,2
2060  REF   7  LAST  591      30,3315  07524 0          STORE    S22UNRL +18D,1
2061                          30,3316  61110 0          INCR,1   TIX,2
2062                          30,3317  77771 0          DEC      -6
2063  REF   1                 30,3320  61312 0                   S2231NXT
2064                          30,3321  77616 0          RVQ
2065                          30,3322  70740 0  GETTF    LXC,1    DLOAD*    SET MPAC= TF
2066  REF   7  LAST  597      30,3323  02750 1                   S22LCC
2067                          30,3324  00001 0                   0,1
2068                          30,3325  77616 0          RVQ
```

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2069                                30,3326   43014 C  S22FLGS  SET     SET              INTEGRATION FLAGS
2070  REF   9  LAST  593            30,3327   01476 C                   DIMOFLAG
2071  REF   4  LAST  593            30,3330   01475 C                   D6ORSFLG
2072                                30,3331   43014 C           SET     SET
2073  REF   9  LAST  574            30,3332   01474 1                   VINTFLAG
2074  REF   2  LAST  574            30,3333   01472 1                   STATEFLG
2075                                30,3334   43414 1           CLEAR   RVQ
2076  REF   9  LAST  574            30,3335   01673 1                   INTYPFLG

R2077 SUBROUTINE TO MODIFY ALT AND STORE LAT TO LAT+5 IN LANDLAT TO LANDLAT+5
R2078 PRIOR TO DISPLAY.

2079                                30,3336   77745 1  LLASRQ   DLOAD                  ALT , LANDALT METERS B-29
2080  REF   4  LAST  272            30,3337   01110 C                   ALT
2081  REF   3  LAST  275            30,3340   16362 1           STODL   LANDALT
2082  REF   5  LAST  274            30,3341   01106 1                   LONG
2083                                30,3342   77742 C           SR1
2084  REF   3  LAST  275            30,3343   02360 C           STORE   LANDLONG
2085                                30,3344   77616 C           RVQ
R2086 SUBROUTINE TO MODIFY LANDALT AND STORE LANDALT TO LANDALT+5 IN LAT TO
R2087 LAT+5 AFTER LMK DATA LOADED BY ASTRONAUT.

2088                                30,3345   77745 1  LLASRQA  DLOAD                  ALT , LANDALT METERS B-29
2089  REF   4  LAST  599            30,3346   02362 1                   LANDALT
2090  REF   5  LAST  599            30,3347   15110 C           STODL   ALT
2091  REF   4  LAST  599            30,3350   02360 C                   LANDLONG
2092                                30,3351   77752 1           SL1
2093  REF   6  LAST  599            30,3352   01106 1           STORE   LONG
2094                                30,3353   77616 C           RVQ
2095                                30,3354   40220 C  9DWTO6DW STQ     SETPD
2096  REF   1                       30,3355   01214 1                   9DWXX
2097                                30,3356   00001 C                   0D
2098                                30,3357   41575 C           VLOAD   PUSH             CLEAR WORKING AREA OF PUSHLIST
2099  REF   4  LAST  543            30,3360   15332 1                   HI6ZEROS         INCLUDING P
2100                                30,3361   41406 C           PUSH    PUSH             PD 18D
2101                                30,3362   77731 1           SSP
2102  REF   1                       30,3363   00017 1                   9DWJ             J=29   USE 2*29 FOR DP WORDS
2103                                30,3364   00072 1           DEC     58
2104                                30,3365   66150 C  9DWI=J   LXA,1   SXA,1            SET I=J
2105  REF   2  LAST  599            30,3366   00016 C                   9DWJ
2106  REF   1                       30,3367   00012 1                   9DWI
2107                                30,3370   77624 1  9DWEPCAL CALL
2108  REF   1                       30,3371   61606 C                   ROWDCT
2109                                30,3372   77750 C           LXA,1                    P VARIES 0-20 INSTEAD OF 20-0
2110  REF   1                       30,3373   00010 C                   9DWP
2111  REF   1                       30,3374   06641 1           STORE   EMATRIX +40D,1
2112                                30,3375   66110 1           INCR,1  SXA,1
2113                                30,3376   00002 C           DEC     2
2114  REF   2  LAST  599            30,3377   00010 C                   9DWP
2115                                30,3400   46135 1           SLOAD   BHIZ             TEST I=0
```

```
2116  REF  2  LAST  599  30,3401  00013 C                  9DWI
2117  REF  1             30,3402  61417 1                  9DWTESTJ
2118                     30,3403  77625 C          DSU
2119  REF  2  LAST  555  30,3404  21646 C                  9DWIC
2120  REF  3  LAST  60C  30,3405  00013 C          STORE   9DWI
2121                     30,3406  46025 1          DSU     BHIZ
2122  REF  1             30,3407  21644 1                  9DW26D
2123  REF  1             30,3410  61413 C                  9DWSETI2
2124                     30,3411  77650 1          GOTO
2125  REF  1             30,3412  61370 1                  9DWEPCAL
2126                     30,3413  52131 C  9DWSETI2 SSP     GOTO
2127  REF  4  LAST  60C  30,3414  00013 C                  9DWI
2128                     30,3415  00004 C          DEC     4
2129  REF  2  LAST  60C  30,3416  61370 1                  9DWEPCAL
2130                     30,3417  46135 1  9DWTESTJ SLOAD   BHIZ
2131  REF  3  LAST  599  30,3420  00017 1                  9DWJ
2132  REF  1             30,3421  61436 1                  9DWFIG6
2133                     30,3422  77625 C          DSU
2134  REF  3  LAST  60C  30,3423  21646 C                  9DWIC
2135  REF  4  LAST  60C  30,3424  00017 1          STORE   9DWJ
2136                     30,3425  46025 1          DSU     BHIZ
2137  REF  2  LAST  60C  30,3426  21644 1                  9DW26D
2138  REF  1             30,3427  61432 C                  9DWSETJ2
2139                     30,3430  77650 1          GOTO
2140  REF  1             30,3431  61365 C                  9DWI=J
2141                     30,3432  52131 C  9DWSETJ2 SSP     GOTO
2142  REF  5  LAST  60C  30,3433  00017 1                  9DWJ
2143                     30,3434  00004 C          DEC     4
2144  REF  2  LAST  60C  30,3435  61365 C                  9DWI=J
2145                     30,3436  77624 1  9DWFIG6  CALL
21451 REF 15  LAST  599  30,3437  56712 C                  GRP2PC
21452                    30,3440  77331 C          SSP     VLOAD
2146  REF  6  LAST  60C  30,3441  00017 1                  9DWJ
2147                     30,3442  00072 1          DEC     58
2148  REF  5  LAST  599  30,3443  15332 1                  HI6ZEROS
2149  REF  3  LAST  599  30,3444  00011 1          STORE   9DWP
2150                     30,3445  66370 C          AXT,1   SSP
2151                     30,3446  00154 1          DEC     108
2152  REF 14  LAST  599  30,3447  00051 C                  S1
2153                     30,3450  00006 1                  6
2154  REF 47  LAST  59C  30,3451  06555 1  CLEARW54 STORE  W +108D,1
2155                     30,3452  77700 C          TIX,1
2156  REF  1             30,3453  61451 C                  CLEARW54
2157                     30,3454  66150 C  9DWI=JA  LXA,1   SXA,1
2158  REF  7  LAST  60C  30,3455  00016 C                  9DWJ
2159  REF  5  LAST  60C  30,3456  00012 1                  9DWI
2160                     30,3457  77624 1          CALL
2161  REF  2  LAST  599  30,3460  61606 C                  ROWDCT
2162                     30,3461  43750 1          LXA,1   BDSU*
2163  REF  4  LAST  60C  30,3462  00010 C                  9DWP
```

I=I-1

TEST I=26

NEXT E SUB P

I=2

TEST J=0

J=J-1

TEST J=26

SET J=2

START OF FIGURE 2.4-6

J=29

P,N,I=0

CLEAR W0 TO W54

I=J

```
2164  REF  2  LAST  595   30,3463  02641 C                  EMATRIX +400,1
2165                       30,3464  66110 1          INCR,1  SXA,1          -(P+1)
2166                       30,3465  00002 C                  2
2167  REF  5  LAST  60C   30,3466  00010 C                  9DWP
2168                       30,3467  54140 C          LXC,1   XSU,1          -(I+N)
2169  REF  6  LAST  60C   30,3470  00012 1                  9DWI
2170  REF  1               30,3471  00014 1                  9DWN
2171                       30,3472  71244 C          BPL     DLOAD          TEST WSQ LTE 0
2172  REF  1               30,3473  61477 1                  9DWAAA
2173  REF  6  LAST  60C   30,3474  15332 1                  HI6ZEROS       W=0
2174                       30,3475  77650 1          GOTO
2175  REF  1               30,3476  61500 C                  9DWAAB
2176                       30,3477  77766 C  9DWAAA  SQRT                   W= SQRT(WSQ)
2177  REF  48  LAST  60C   30,3500  06401 1  9DWAAB  STORE   W,1
2178  REF  1               30,3501  14001 C          STODL   WORKW
2179  REF  8  LAST  60C   30,3502  00017 1                  9DWJ           TEST J=0
2180                       30,3503  77630 1          BHIZ
2181  REF  1               30,3504  61572 C                  9DWEXITX       EXIT
2182                       30,3505  46135 1  TST2I=0 SLOAD   BHIZ           TEST I=0
2183  REF  7  LAST  601   30,3506  00013 C                  9DWI
2184  REF  1               30,3507  61550 C                  9DWN=N+3
2185                       30,3510  77625 C          DSU
2186  REF  4  LAST  60C   30,3511  21646 C                  9DWID
2187  REF  8  LAST  601   30,3512  00013 C          STORE   9DWI           I=I-1
2188                       30,3513  46025 1          DSU     BHIZ           TEST I=26
2189  REF  3  LAST  60C   30,3514  21644 1                  9DW26D
2190  REF  1               30,3515  61520 1                  9DWAAC
2191                       30,3516  77650 1          GOTO
2192  REF  1               30,3517  61523 1                  9DWNEXEP
2193                       30,3520  77731 1  9DWAAC  SSP                    I=2
2194  REF  9  LAST  601   30,3521  00013 C                  9DWI
2195                       30,3522  00004 C                  4
2196                       30,3523  77624 1  9DWNEXEP CALL
2197  REF  3  LAST  60C   30,3524  61606 C                  ROWDCT
2198                       30,3525  43750 1          LXA,1   BDSU*           (EP-ROWI*ROWJ)/W
2199  REF  6  LAST  601   30,3526  00010 C                  9DWP
2200  REF  3  LAST  601   30,3527  02641 C                  EMATRIX +400,1
2201                       30,3530  62071 C          DDV     INCR,1         P=P+1
2202  REF  2  LAST  601   30,3531  00001 C                  WORKW
2203                       30,3532  00002 C                  2
2204                       30,3533  70130 1          SXA,1   LXC,1
2205  REF  7  LAST  601   30,3534  00010 C                  9DWP
2206  REF  10  LAST  601  30,3535  00012 1                  9DWI
2207                       30,3536  40060 C          XSU,1   BOV            -(I+N)
2208  REF  2  LAST  601   30,3537  00014 1                  9DWN
2209  REF  1               30,3540  61543 1                  SETWIN=0
2210                       30,3541  77650 1          GOTO
2211  REF  1               30,3542  61545 1                  9DWSETWX
2212                       30,3543  77745 1  SETWIN=0 DLOAD                 W(I+N)=0
2213  REF  7  LAST  601   30,3544  15332 1                  HI6ZEROS
```

```
2214   REF  49  LAST  601   30,3545   06401 1  9DWSETWX STORE  W,1
2215                        30,3546   77650 1           GOTO
2216   REF   1              30,3547   61505 0                   TST2I=0
2217                        30,3550   62150 1  9DWN=N+3 LXA,1   INCR,1        N=N+3
2218   REF   3  LAST  601   30,3551   00014 1                   9DWN
2219                        30,3552   00006 1                   6
2220                        30,3553   67330 0           SXA,1   SLOAD         J=J-1
2221   REF   4  LAST  602   30,3554   00014 1                   9DWN
2222   REF   9  LAST  601   30,3555   00017 1                   9DWJ
2223                        30,3556   77625 0           DSU
2224   REF   5  LAST  601   30,3557   21646 0                   9DWID
2225   REF  10  LAST  602   30,3560   00017 1           STORE   9DWJ
2226                        30,3561   46025 1           DSU     BHIZ          TEST J=26
2227   REF   4  LAST  601   30,3562   21644 1                   9DW26D
2228   REF   1              30,3563   61566 0                   SETJ=2A
2229                        30,3564   77650 1           GOTO
2230   REF   1              30,3565   61454 0                   9DWI=JA
2231                        30,3566   52131 0  SETJ=2A  SSP     GOTO          J=2
2232   REF  11  LAST  602   30,3567   00017 1                   9DWJ
2233                        30,3570   00004 0                   4
2234   REF   2  LAST  602   30,3571   61454 0                   9DWI=JA
2235                        30,3572   77624 1  9DWEXITX CALL
22351  REF  16  LAST  60C   30,3573   56712 0                   GRP2PC
22352                       30,3574   66370 0           AXT,1   SSP           CLEAR W6,W7,W8 USED TEMP FOR EMATRIX
2236                        30,3575   00066 1           DEC     54
2237   REF  15  LAST  60C   30,3576   00051 0                   S1
2238                        30,3577   00006 1                   6
2239                        30,3600   77775 1           VLOAD
2240   REF   8  LAST  601   30,3601   15332 1                   HI6ZEROS
2241   REF  5C  LAST  602   30,3602   06643 0  9DWEXXXA STORE   W +162D,1
2242                        30,3603   52100 1           TIX,1   GOTO
2243   REF   1              30,3604   61602 1                   9DWEXXXA
2244   REF   2  LAST  599   30,3605   01214 1                   9DWXX
2245                        30,3606   40131 0  ROWDOT   SSP     BOV
2246   REF   1              30,3607   00007 0                   XTMP1
2247                        30,3610   00377 1           OCT     377
2248                        30,3611   61612 0                   +1
2249                        30,3612   71140 1           LXC,1   LXC,2
2250   REF  11  LAST  601   30,3613   00012 1                   9DWI
2251   REF  12  LAST  602   30,3614   00016 0                   9DWJ
2252                        30,3615   41545 0           DLOAD   PUSH
2253   REF   9  LAST  602   30,3616   15332 1                   HI6ZEROS
2254                        30,3617   56743 1  ROWDOT1  DLOAD*  DMPR*
2255   REF  51  LAST  602   30,3620   02401 0                   W,1
2256   REF  52  LAST  602   30,3621   75376 1                   W,2
2257                        30,3622   41415 1           DAD     PUSH
2258                        30,3623   62000 0           BOV     INCR,1
2259   REF   1              30,3624   61640 1                   ROWDOT3
2260                        30,3625   77771 0           DEC     -6
2261                        30,3626   67314 0           INCR,2  SLOAD
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2262                                30,3627  77771 C            DEC     -6
2263  REF   2  LAST  602           30,3630  00007 C                    XTMP1
2264                                30,3631  70430 1            BHIZ    SR1
2265  REF   1                      30,3632  61636 C                    ROWDCT2
2266  REF   3  LAST  603           30,3633  00007 C            STORE   XTMP1
2267                                30,3634  77650 1            GOTO
2268  REF   1                      30,3635  61617 C                    ROWDCT1
2269                                30,3636  77745 1  ROWDCT2   DLOAD
2270                                30,3637  77616 C            RVQ
2271                                30,3640  77614 1  ROWDCT3   CLRGO
2272  REF   6  LAST  593           30,3641  01631 1                    ORBWFLAG
2273  REF   2  LAST  603           30,3642  61636 C                    ROWDCT2
2274                                   0000          WORKW    =       0D
2275                                   0006          XTMP1    =       6D
2276                                   0010          9DWP     =       8D          P
2277                                   0012          9DWI     =       10D         I
2278                                   0014          9DWN     =       12D         N
2279                                   0016          9DWJ     =       14D         J
2280  REF   3  LAST  596              1214          9DWXX    =       S22UOFF
2281  REF  16  LAST  594           E7,1501          S22UMRL  =       BVECTOR     18
2282  REF   9  LAST  595              1256          S22UUT   =       DELTAX      18
2283                                   0022          S223X1   =       18D         6
2284                                   0030          S221X3   =       24D         6
2285                                   0036          S22C     =       30D         2
2286                                   0040          S22RHO   =       32D         2
2287  REF  53  LAST  602           E5,1634          S22RL    =       W +156D     6
2289                                30,3643  00064 C  9DW26D   2DEC    52 B-14
2289                                30,3644  00000 1
2290                                30,3645  00002 C  9DWID    2DEC    2 B-14
2290                                30,3646  00000 1
2291                                30,3647  10306 C  SCTVAR   2DEC    1.0 E-6 B+18
2291                                30,3650  36750 C
2292                                30,3651  00253 C  IMUVARR  2DEC    0.04 E-6 B+18
2292                                30,3652  31436 1
2293                                30,3653  10000 C  DEC1B2   2DEC    1 B-2
2293                                30,3654  00000 1
2294                                30,3655  01461 C  V06N49EE VN      00649
2295                                30,3656  01531 1  V06N89B  VN      00689
2299  REF   5  LAST  572              1214          S22UOFF  =       LEMPCS      6       U SUB OFF
2300  REF   2  LAST  563           23,2000                   SETLOC  P20S2
2301                                23,3136                   BANK
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L P20-P25 USER'S PAGE NO. 55 E5 S3

P2371

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P2372   SUBROUTINE NAME:   V89CALL
R2373   MOD NO:  0                       DATE: 8 FEB 1968
R2374   MOD BY:  DIGITAL DEVEL GROUP     LOG SECTION: P20-P25

R2375   FUNCTIONAL DESCRIPTION:

R2376   CALLED BY VERB 89 ENTER DURING P00. PRIO 10 USED. CALCULATES AND
R2377   DISPLAYS FINAL GIMBAL ANGLES TO POINT CSM +X AXIS OR PREFERRED AXIS
R2378   (UNIT(Z)COS55 DEG + UNIT(X)SIN55 DEG) AT LM.

R2379   1. KEY IN V 89 E ONLY IF IN PROG 00. IF NOT IN P00, OPERATOR ERROR AND
R2380   EXIT R63, OTHERWISE CONTINUE.

R2381   2. IF IN P00, DO IMU STATUS CHECK (R02BCTH). IF IMU ON AND ITS
R2382   ORIENTATION KNOWN TO CGC, CONTINUE.

R2383   3. FLASH DISPLAY V 04 N 06. R2 INDICATES WHICH SPACECRAFT AXIS IS TO
R2384   BE POINTED AT LM.  INITIAL CHOICE IS PREFERRED AXIS. (R2=1).
R2385   ASTRONAUT CAN CHANGE TO (+X) AXIS (R2 NOT= 1) BY V 22 E 2 E. CONTINUE
R2386   AFTER KEYING IN PROCEED.

R2387   4. SET PREFERRED ATTITUDE FLAG ACCORDING TO OPTION DESIRED. SET FLAG
R2388   FOR PREFERRED AXIS. RESET FLAG FOR X AXIS.

R2389   5. CURRENT TIME IS STORED AND R63COMP IS CALLED

R2390        R63COMP JOB:

R2391          UPDATES CSM AND LM STATE VECTORS USING CONIC EQUATIONS

R2392          CALCULATES BOTH PREFERRED AND X AXIS TRACKING ATT FROM CSM TO LM.

R2393          DESIRED GIMBAL ANGLES AS INDICATED BY PREFERRED ATTITUDE FLAG
R2394          ARE STORED FOR LATER R60CSM CALL.

R2395   6. FLASH DISPLAY V 06 N18 AND AWAIT RESPONSE.

R2396   7. RECYCLE- RETURN TO STEP 5.
R2397      TERMINATE- EXIT R63 ROUTINE
R2398      PROCEED- RESET 3AXISFLG AND CALL R60CSM FOR ATTITUDE MANEUVER.


R2399   CALLING SEQUENCE: V 89 E

R2400   SUBROUTINES CALLED: CHKPOCH, R02BOTH, GOXDSPF, R63COMP, R60CSM

R2401   ALARMS   1. OPERATOR ERROR IF NOT IN P00
R2402            2. PROGRAM ALARM IF IMU IS OFF
R2403            3. PROGRAM ALARM IF IMU ORIENTATION IS UNKNOWN
```

R2404 ERASABLE INITIALIZATION REQUIRED: NONE

R2405 DEBRIS: OPTION1, OPTION1+1, PREFTRKAT(PREF ATT FLAG),P21TIME, 3AXISFLG

```
24055                          23,3136   00000 1  DP1MIN   2DEC   6000
24055                          23,3137   13560 0

2406   REF  13  LAST  584      E4,1715                    EBANK= P21TIME
2407                           34,3603                    BANK   34
2408   REF   2  LAST  580      34,2000                    SETLOC P20S4
2409                           34,3603                    BANK
2410   REF   1                                           COUNT* $$/R63

2411   REF 144  LAST  597      34,3603   0 4555 0 V89CALL TC     BANKCALL     IMU STATUS CHECK. RETURNS IF ORIENTATION
2412   REF   3  LAST  553      34,3604    17573 0         CADR   R02BOTH      KNOWN. ALARMS IF NOT.
2413   REF  19  LAST  563      34,3605   3 6214 0         CAF    THREE        ALLOW ASTRONAUT TO SELECT DESIRED
2414   REF   6  LAST  516      34,3606   55'131 1         TS     OPTION1      TRACKING ATTITUDE AXIS.
2415   REF  72  LAST  593      34,3607   3 4712 1         CAF    ONE
2416   REF   7  LAST  606      34,3610   55'132 1         TS     OPTION1 +1
2417   REF   1                34,3611   3 3652 0         CAF    V06N06       V 04 N 06
2418   REF 145  LAST  606      34,3612   0 4555 0         TC     BANKCALL
2419   REF  20  LAST  597      34,3613    20624 0         CADR   GOFLASH
2420   REF  26  LAST  509      34,3614   0 5423 1         TC     ENDEXT       TERMINATE
2421                           34,3615   0 3617 1         TC     +2           PROCEED
2422                           34,3616   0 3611 1         TC     -5           DATA IN. OPTION1 +1 = 1 FOR PREF AXIS
A2423                                                                                = 2 FOR X AXIS
2424   REF   8  LAST  606      34,3617   4 1132 1         CS     OPTION1 +1   1 FOR PREF AXIS. 2 FOR X AXIS.
2425   REF  73  LAST  606      34,3620   6 4712 1         AD     ONE
2426                           34,3621   0 0006 1         EXTEND
2427   REF   1                34,3622   1 3647 0         BZF    SETPAF
2428   REF  31  LAST  563      34,3623   0 5447 0 RSTPAF  TC     DOWNFLAG     RESET PREF ATT FLAG FOR R63COMP
2429   REF   2  LAST   53      34,3624    00120 1         ADRES  RNGSCFLG     TO DO X AXIS. RESET BIT 10  FLAG 5
2430   REF 109  LAST  597      34,3625   0 6006 1 V89RECL TC     INTPRET
2431                           34,3626    43234 0         RTB    DAD
2432   REF  17  LAST  581      34,3627    45505 0                LOADTIME     READ PRESENT TIME
24325  REF   1                34,363C    07137 0                DP1MIN       INTEGRATE TO 1 MIN FROM NOW
2433   REF  14  LAST  606      34,3631    36316 0         STCALL P21TIME      STORE TIME FOR CALL TO R63COMP.  R63COMP
2434   REF   1                34,3632    71463 0                R63CCMP      LEAVES DESIRED GIM ANGS IN THETAD,LOS IN
2435                           34,3633    77776 1         EXIT                POINTVSM, AND SELECTED AXIS IN SCAXIS.
2436   REF   1                34,3634   3 3653 1         CAF    V06N18       V 06 N 18
2437   REF 146  LAST  606      34,3635   0 4555 0         TC     BANKCALL     NOUN 18 REFERS TO THE DESIRED GIMBAL
2438   REF  21  LAST  606      34,3636    20624 0         CADR   GOFLASH
2439   REF  27  LAST  606      34,3637   0 5423 1         TC     ENDEXT       TERMINATE
2440                           34,3640   0 3642 1         TC     +2           PROCEED
2441   REF   1                34,3641   0 3625 0         TC     V89RECL      RECYCLE
2442   REF  32  LAST  606      34,3642   0 5447 0         TC     DOWNFLAG     RESET 3 AXIS FLAG
2443   REF   4  LAST  562      34,3643    00124 0         ADRES  3AXISFLG     RESET BIT 6 FLAG 5
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2444  REF 147  LAST  606   34,3644  0 4555 C          TC      BANKCALL        PERFORMS CSM MANEUVER TO ALIGN SELECTED
2445  REF   3  LAST  563   34,3645   56000 1          CADR    R60CSM          SPACECRAFT AXIS TO LOS.
2446  REF  28  LAST  606   34,3646  1 5423 C          TCF     ENDEXT

2447  REF  30  LAST  563   34,3647  0 5435 C  SETPAF  TC      UPFLAG          SET PREFERRED ATT FLAG FOR R63COMP
2448  REF   3  LAST  606   34,3650   00120 1          ADRES   RNGSCFLG        TO DO PREF AXIS. SET BIT 10  FLAG 5.
2449  REF   2  LAST  606   34,3651  0 3625 C          TC      V89RECL

2450                       34,3652   01006 C  V804N06  VN      0406
2451                       34,3653   01422 1  V806N18  VN      0618

2452  REF   2  LAST  581   34,3463           R63COMP  EQUALS  R63
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R2453   PROGRAM NAME- P23 CISLUNAR MIDCOURSE NAVIGATION
R2454   MCC NO
R2455   MCC BY- TOM KNATT
R2456   FUNCTIONAL DESCRIPTION- DO MIDCOURSE NAVIGATION BY INCORPORATION OF STAR
R2457   /EARTH AND STAR/MOON OPTICAL MEASUREMENTS.
R2458   CALLING SEQUENCE- ASTRONAUT OPERATED
R2459   SUBROUTINES CALLED-R52,R53,R57,R60,ORBITAL INTEGRATION (INTEGRV)
R2460   INCORP1,INCORP2,LALOTORV,LUNLMKLD,AND DISPLAY INTERFACE ROUTINES.
R2461   NORMAL EXIT MODES- VIA ROC
R2462   ALARMS- NONE
R2463   ABORT MODES- NONE
R2464   ERASABLE INITIALIZATION REQUIRED- PAD-LOADED ERASABLES,ORBWFLAG RESET,
R24645  REFSMFLG=0 IF IMU OFF AND REFSMFLG=1 IF IMU ON
R24647  INPUTS BY USER REQUIRED- STAR NUMBER,LANDMARK LAT,LONG/2,ALT OR ID NUMB.
R24648  IF LANDMARK IS USED,        NEAR OR FAR HORIZON IF HORIZON IS USED, AND
R24649  BODY TO BE MARKED ON(EARTH OR MOON).  SEE GSOP CHAPT 4.
R2465   OUTPUT-UPDATED CMC STATE VECTOR. VECTOR FROM S/C TO HORIZON OR LANDMARK
R24651  IN POINTAXS. POINTAXS CAN BE USED TO GENERATE THIS VECTOR APART FROM
R24652  P23 IF DESIRED.
R2466   DEBRIS-NO USABLE DEBRIS IS GENERATED. RENDWFLG IS RESET FOR P20 UPON
R24665  COMPLETION OF P23. RUPTREGS AND ERASABLES USED BY DISPLAYS ARE DEBRIS
 2467                          31,2021                 BANK    31
 2468   REF   1                31,2000                 SETLOC  RT23
 2469                          31,2021                 BANK
 2470   REF   1                                        COUNT   31/S23
 2471   REF  54  LAST  603     E5,1400                 EBANK=  W
 24712  REF  33  LAST  606     31,2021   0 5447 C  P23 TC      DOWNFLAG
 24714  REF   4  LAST  553     31,2022    00010 C      ADRES   RNDV2FLG

 2472   REF  10  LAST  588     31,2023   0 5261 1      TC      2PHSCHNG
 2473                          31,2024    00004 C      OCT     00004          LEAVE GROUP 4
 2474                          31,2025    00012 1      OCT     00012          ENTER GROUP 2
 2475   REF   1                31,2026   3 4760 1      CAF     PRIO13
 2476   REF   3  LAST  567     31,2027   55'056 1      TS      PHSPRDT2
 2477   REF 110  LAST  606     31,2030   0 6006 1      TC      INTPRET
 2478                          31,2031    43131 C      SSP     CLEAR
 2479   REF   4  LAST  554     31,2032    00302 C              MARKINDX
 2480                          31,2033    00001 C              1
 2481   REF   2  LAST  554     31,2034    00666 1              TARG2FLG       TARGET FLAG USED BY R52 AND R53
 2482                          31,2035    66214 C      CLEAR   SSP
 2483   REF   4  LAST  554     31,2036    00665 1              TARG1FLG
 2484   REF   3  LAST  201     31,2037    00305 1              STARIND
 2485                          31,2040    00000 1              0
 2486                          31,2041    43131 C      SSP     CLEAR
 2487   REF   6  LAST  208     31,2042    00303 1              BESTI
 2488                          31,2043    00000 1              0
 24882  REF   1                31,2044    03267 1              R57FLAG        SET = DO NOT REPERFORM R57
 24883                          31,2045    77414 C      CLEAR   EXIT
 24884  REF   2  LAST  259     31,2046    04664 1              V94FLAG        SET = ALLOW V94
 24885  REF 111  LAST  608     31,2047   0 6006 1  P23.00 TC      INTPRET
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2489                                31,2050   45014 C            BON     CALL
2490  REF   4  LAST  574           31,2051   01702 C                    REFSMFLG      SET NOW AS INPUT, NORMALLY EXTERNAL CONT
2491  REF   1                     31,2052   62060 C                    P23.05        WHEN ALIGNED,PERFORM MEASUREMENT
2492  REF   1                     31,2053   76360 C                    R57           DO OPTICS CALIBRATION IF IMU NOT ALIGNED
2493                              31,2054   77624 1            CALL
2494  REF   1                     31,2055   31327 C                    R53
2495                              31,2056   77650 1            GOTO
2496  REF   1                     31,2057   62236 1                    P23.60
2500                              31,2060   77414 C  P23.05    CLEAR   EXIT
2501  REF   1                     31,2061   04665 0                    SAVECFLG      USED TO SAVE SPACE IN P23.65
2502  REF   1                     31,2062  3 3050 1            CAF     V05N70        REQUEST RESPONSE AND DISPLAY MEASUREMENT
2503  REF 148  LAST  607          31,2063  0 4555 C            TC      BANKCALL      IDENTIFICATION- STAR,LMK,HOR  IDENT.
2504  REF  22  LAST  606          31,2064    20624 C           CADR    GOFLASH
2505  REF  28  LAST  597          31,2065  0 4106 1            TC      GOTOPOOH      TERMINATE
2506  REF   1                     31,2066  0 2070 1            TC      P23.15
2507                              31,2067  0 2062 1            TC      -5            REDISPLAY
2508  REF  19  LAST  587          31,2070  3 1751 C  P23.15    CA      LANDMARK      IF C=2,LUNAFLAG=1. IF C=1,LUNAFLAG=0
2509                              31,2071  0 0006 1            EXTEND
2510                              31,2072  1 2074 1            BZF     +2
2511                              31,2073  0 2075 1            TC      +2
2512  REF   4  LAST  274          31,2074  3 1752 C            CA      HORIZON       SET LUNAFLAG FROM HORIZON OR LANDMARK
2513  REF  23  LAST  572          31,2075  7 4703 C            MASK    BIT8
2514                              31,2076  0 0006 1            EXTEND
2515  REF   1                     31,2077  1 2104 1            BZF     P23.16
2516  REF 112  LAST  608          31,2100  0 6006 1            TC      INTPRET
2517                              31,2101   52014 C            SET     GOTO
2518  REF  11  LAST  597          31,2102   01463 1                    LUNAFLAG
2519  REF   1                     31,2103   62107 C                    P23.17
2520  REF 113  LAST  609          31,2104  0 6006 1  P23.16    TC      INTPRET
2521                              31,2105   77614 1            CLEAR
2522  REF  12  LAST  609          31,2106   01663 0                    LUNAFLAG
2523                              31,2107   41535 1  P23.17    SLOAD   PUSH
25231 REF   5  LAST  442          31,2110   00736 C                    STARCODE
25232                             31,2111   41335 1            SLOAD   DMP
25233 REF   1                     31,2112   23055 C                    SPSIX
25234                             31,2113   66150 C            LXA,1   SXA,1
25235 REF 259  LAST  594          31,2114   00155 C                    MPAC +1
25236 REF   7  LAST  608          31,2115   C0302 C                    BESTI         BESTI = 6XSTAR NUMBER
25237                             31,2116   77624 1            CALL
25238 REF   1                     31,2117   30000 1                    LOWMEMRY      NEEDED TO RETRIEVE STAR VECTOR FROM LOW
25239 REF   2  LAST   91          31,2120   02617 C            STORE   STARSAV2      STORE FOR R53,P23. US(IN P23)=STARSAV2
252395                            31,2121   77776 1            EXIT
2524  REF  20  LAST  609          31,2122  3 1751 C            CA      LANDMARK
2525  REF   1                     31,2123  7 3052 1            MASK    OCTOOC77
2526  REF   2  LAST   94          31,2124   55753 C            TS      IDOFLMK       FOR R3(DE) LUNAFLAG ALREADY SET
2527  REF   5  LAST  609          31,2125  3 1752 C            CA      HORIZON
2528                              31,2126  0 0006 1            EXTEND
2529  REF   1                     31,2127  1 2144 C            BZF     P23.12
2530  REF  30  LAST  551          31,2130  7 4706 C            MASK    BIT5          IF D=1,NORFHOR=0(NEAR).D=2,NORFHOR=1,FAR
2531                              31,2131  0 0006 1            EXTEND
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2532   REF   1                  31,2132  1 2137 1          BZF     P23.18
2533   REF 114  LAST  609       31,2133  0 6006 1          TC      INTPRET
2534                             31,2134   52014 0          SET     GOTO
2535   REF   1                  31,2135   00064 0                  NORMHOR
2536   REF   1                  31,2136   62142 1                  P23.19
2537   REF 115  LAST  610       31,2137  0 6006 1  P23.18  TC      INTPRET
2538                             31,2140   77614 1          CLEAR
2539   REF   2  LAST  610       31,2141   00264 1                  NORMHOR
2540                             31,2142   77776 1  P23.19  EXIT
2544   REF   1                  31,2143  0 2156 1          TC      P23.30
2545   REF   3  LAST  609       31,2144  3 1753 1  P23.12  CA      IDOFLMK         IF R2(DE) NONZERO, LMK IS IDENTIFIED
2546                             31,2145  0 0006 1          EXTEND
2547   REF   1                  31,2146  1 2150 0          BZF     P23.20          LANDMARK NOT IDENTIFIED
2548   REF   2  LAST  610       31,2147  0 2156 1          TC      P23.30          LANDMARK IS IDENTIFIED
2549   REF   1                  31,2150  3 3047 1  P23.20  CAF     V6N89           REQUEST RESPONSE AND DISPLAY LMK DATA
2550   REF 149  LAST  609       31,2151  0 4555 0          TC      BANKCALL        R1=LAT,R2=LONG/2,R3=ALT
2551   REF  23  LAST  609       31,2152   20624 0          CADR    GOFLASH
2552   REF  29  LAST  609       31,2153  0 4106 1          TC      GOTOPOOH        TERMINATE
2553   REF   3  LAST  610       31,2154  0 2156 1          TC      P23.30
2554   REF   2  LAST  610       31,2155  0 2150 1          TC      P23.20          STORE NEW DATA AND REDISPLAY
2555   REF 116  LAST  610       31,2156  0 6006 1  P23.30  TC      INTPRET
2556                             31,2157   77414 0          BON     EXIT
2557   REF   2  LAST  609       31,2160   04705 1                  SAVECFLG
2558   REF   1                  31,2161   62265 1                  P23.65
2559   REF   1                  31,2162  3 3053 1          CAF     V50N25P
2560   REF 150  LAST  610       31,2163  0 4555 0          TC      BANKCALL
2561   REF   1                  31,2164   20751 0          CADR    GOPERF1         GOPERF1 BLANKS OUT R2 AND R3.
2562   REF  30  LAST  610       31,2165  0 4106 1          TC      GOTOPOOH
2563   REF   2  LAST  206       31,2166  0 2173 0          TC      V94ENTER        PROCEED. AUTOCONTROL CMC
2564   REF   1                  31,2167  0 2170 0          TC      P23.55          ENTER. MANUAL CONTROL
2565   REF 117  LAST  610       31,2170  0 6006 1  P23.55  TC      INTPRET
2566                             31,2171   77650 1          GOTO
2567   REF   1                  31,2172   62224 1                  P23.56
R2568          VERB 94 BEGINS HERE
2569   REF 118  LAST  610       31,2173  0 6006 1  V94ENTER TC     INTPRET
2570                             31,2174   77634 0          RTB
2571   REF  18  LAST  606       31,2175   45505 0                  LOADTIME        READ CLOCK
2572   REF   8  LAST  575       31,2176   35225 1          STCALL  MARKTIME
2573   REF   1                  31,2177   62272 1                  POINTAXS        RETURN LOS IN RCLL AND MPAC
2574                             31,2200   53521 1          MXV     UNIT
2575   REF  17  LAST  584       31,2201   01736 1                  REFSMMAT
2576   REF   4  LAST  584       31,2202   27357 0          STOVL   POINTVSM
2577   REF   1                  31,2203   23056 0                  JCAXIS
2578   REF  14  LAST  589       31,2204   03351 0          STORE   SCAXIS
2579                             31,2205   77776 1          EXIT
2580   REF  34  LAST  608       31,2206  0 5447 0          TC      DOWNFLAG        CLEAR AND GO TO VECPOINT IN R60
2581   REF   5  LAST  606       31,2207   00124 0          ADRES   3AXISFLG        BIT 6  FLAG 5
2584   REF   1                  31,2210  3 3063 1          CAF     R60ADRS
2585   REF   3  LAST  196       31,2211   54 374 0         TS      TEMPFLSH
2586   REF  35  LAST  596       31,2212  0 5301 0          TC      PHASCHNG
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2587                                    31,2213   00012 1             OCT     00012
25871 REF 151 LAST 610                  31,2214   0 4555 C  R60CALL   TC      BANKCALL
25872 REF   4 LAST 607                  31,2215   56000 1             CADR    R60CSM
25873 REF  36 LAST 610                  31,2216   0 5301 C            TC      PHASCHNG
25874                                   31,2217   04022 C             OCT     04022
2588  REF 119 LAST 610                  31,2220   0 6006 1            TC      INTPRET
2589                                    31,2221   77614 1             BON
2590  REF   2 LAST 608                  31,2222   03307 C                     R57FLAG
2591  REF   1                           31,2223   62226 C                     P23.57          DO NOT REPERFORM R57
2592                                    31,2224   77624 1  P23.56     CALL
2593  REF   2 LAST 609                  31,2225   76360 C                     R57
2594                                    31,2226   43014 0  P23.57     SET     SET
2595  REF   3 LAST 608                  31,2227   04464 C                     V94FLAG
2596  REF   3 LAST 611                  31,2230   03067 C                     R57FLAG
2597                                    31,2231   77624 1             CALL
2598  REF   3 LAST 554                  31,2232   30002 C                     R52
2608                                    31,2233   43014 C             CLEAR   CLEAR
2609  REF   4 LAST 611                  31,2234   04664 1                     V94FLAG
2610  REF   4 LAST 611                  31,2235   03267 1                     R57FLAG
2611                                    31,2236   77776 1  P23.60     EXIT
2612                                    31,2237   0 0004 C            INHINT
2613  REF  33 LAST 588                  31,2240   3 1330 C            CA      MARKSTAT
2614  REF   6 LAST 411                  31,2241   7 4747 C            MASK    LOWIC
2615  REF   5 LAST 589                  31,2242   55*242 C            TS      MARKDATA
2616                                    31,2243   0 0006 1            EXTEND
2617  REF   6 LAST 611                  31,2244   5 1242 1            INDEX   MARKDATA
2618                                    31,2245   3 0001 C            DCA     0
2619  REF   9 LAST 610                  31,2246   53*225 1            DXCH    MARKTIME
2620  REF   7 LAST 611                  31,2247   51*242 1            INDEX   MARKDATA
2621                                    31,2250   3 0005 1            CA      5
2622  REF   1                           31,2251   57*754 C            XCH     TRUNICN
2623                                    31,2252   0 0003 1            RELINT
2624  REF   1                           31,2253   3 3051 C            CAF     V05N71
2625  REF 152 LAST 611                  31,2254   0 4555 C            TC      BANKCALL
2626  REF  24 LAST 610                  31,2255   20624 C             CADR    GOFLASH
2627  REF  31 LAST 610                  31,2256   0 4106 1            TC      GOTOPOOH        TERMINATE
2628  REF   1                           31,2257   0 2261 C            TC      P23.65          STORE DATA
2629                                    31,2260   0 2253 1            TC      -5              REDISPLAY
2630  REF 120 LAST 611                  31,2261   0 6006 1  P23.65     TC      INTPRET
2631                                    31,2262   77414 C             SET     EXIT
2632  REF   3 LAST 610                  31,2263   04465 1                     SAVECFLG
2633  REF   2 LAST 609                  31,2264   0 2070 1            TC      P23.15
2639                                    31,2265   45014 C  P23.85     CLEAR   CALL
2640  REF   8 LAST 588                  31,2266   02676 1                     RENDWFLG
2641  REF   2 LAST 610                  31,2267   62272 1                     POINTAXS
2642                                    31,2270   77650 1             GOTO
2643  REF   1                           31,2271   62364 1                     R23.55
R2644 WE BEGIN CALCULATIONS HERE
R2645 POINTAXIS SUBROUTINE
2646                                    31,2272   67220 C  POINTAXS   STQ     SLOAD
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2647  REF   5  LAST  574   31,2273   01150 1                 POINTEX
2648  REF  21  LAST  609   31,2274   02752 0                 LANDMARK        IF LANDMARK=0 HORIZON IS DESIRED.
26481                       31,2275   67230 1           BHIZ  SLOAD           DO NOT PICK UP LMK VALUES FROM TABLE
26482 REF   1               31,2276   62307 1                 R23.05          OR DISPLAY IN HORIZON CASE
26483 REF   4  LAST  610   31,2277   02754 0                 IDOFLMK
2649                        31,2300   45030 0           BHIZ  CALL
2650  REF   1               31,2301   62305 0                 R23.0
2651  REF   1               31,2302   63064 0                 LUNLMKLD
2652                        31,2303   77650 1           GOTO
2653  REF   2  LAST  612   31,2304   62307 1                 R23.05
2654                        31,2305   77624 1  R23.0    CALL                  MUST BE DONE 2ND TIME, TO ALLOW CHANGES
2655  REF   2  LAST  556   31,2306   61345 1                 LLASRDA
2656                        31,2307   71214 0  R23.05   BON   DLOAD
2657  REF   7  LAST  603   31,2310   01711 1                 ORBWFLAG
2658  REF   1               31,2311   62315 1                 R23.1
26582 REF   1               31,2312   03001 0                 WMIDPOS
26584                       31,2313   34001 1           STCALL 0
2659  REF   2  LAST  569   31,2314   56544 1                 INITIALW        INITIALIZE W-MATRIX FIRST PASS IN P23
2660                        31,2315   77624 1  R23.1    CALL
2661  REF   6  LAST  571   31,2316   56343 0                 SETIATG         SETUP FOR CSM INTEGRATION
2662                        31,2317   43014 0           BOF   SET
2663  REF   8  LAST  612   31,2320   01751 0                 ORBWFLAG
2664  REF   1               31,2321   62323 1                 R23.2
2665  REF  10  LAST  599   31,2322   01476 0                 DIMOFLAG
2666                        31,2323   45014 0  R23.2    SET   CALL
2667  REF   9  LAST  612   31,2324   01471 1                 ORBWFLAG
2668  REF   9  LAST  589   31,2325   27113 1                 INTEGRV         INTEGRATE CSM STATE VEC. TO MARKTIME
2669                        31,2326   77776 1           EXIT
2670  REF  37  LAST  611   31,2327   0 5301 0          TC    PHASCHNG
2671                        31,2330   04022 0           OCT   04022
2672  REF 121  LAST  611   31,2331   0 6006 1          TC    INTPRET
2673                        31,2332   77624 1           CALL
2674  REF   1               31,2333   62767 0                 RECT.1          PICKUP CSM STATE VECTOR FROM PERM
2675                        31,2334   77214 0           BOFF  VLOAD
2676  REF   1               31,2335   00345 0                 ZMEASURE        IN SPHERE OF INFLUENCE OF PRIMARY BODY
2677  REF   1               31,2336   62341 0                 R23.3
2678  REF   5  LAST   86    31,2337   02272 1                 RQVV            CALCULATED BY INTEGRATION  B29
2679  REF   2  LAST  118    31,2340   03627 1           STORE RZC
2680                        31,2341   46135 1  R23.3    SLOAD BHIZ
2681  REF  22  LAST  612   31,2342   02752 0                 LANDMARK        IF LANDMARK = 0, USE HORIZ SUBR
2682  REF   1               31,2343   62353 0                 R23.4
2683                        31,2344   77614 1           SET
2684  REF   5  LAST  589   31,2345   00462 1                 ERADFLAG
2685                        31,2346   45145 0           DLOAD CALL
2686  REF  10  LAST  611   31,2347   01225 0                 MARKTIME
2687  REF   3  LAST  596   31,2350   26373 1                 LALOTORV
2688                        31,2351   77650 1           GOTO
2689  REF   1               31,2352   62355 0                 R23.5
2690                        31,2353   77624 1  R23.4    CALL
2691  REF   1               31,2354   62527 0                 HORIZ
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2692  REF  2  LAST  118   31,2355   03665 1  R23.5   STORE  RL
2693                       31,2356   40251 C          VSU    SETPD
2694  REF  3  LAST  612   31,2357   03627 1          RZC
2695                       31,2360   00001 C          0
2696  REF  2  LAST  118   31,2361   03657 C          STORE  RCLL
2697                       31,2362   77650 1          GOTO
2698  REF  6  LAST  612   31,2363   01150 1          POINTEX
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P2699
 2700                          31,2364   41456 C  R23.55  UNIT    PUSH      RCLL IS IN MPAC
 2701                          31,2365   77775 1          VLOAD
 2702                          31,2366   00043 0                    34D     RCLL * RCLL
 2703                          31,2367   24037 C          STOVL     30D     PUSH 30-31 =RCLL*RCLL 32-33=ABVAL RCLL
 2704  REF  2  LAST  118       31,2370   03635 1                    VZC
 2705                          31,2371   54361 1          VXSC      VSR
 2706  REF  1                  31,2372   23030 C                    ONE/C
 2707                          31,2373   20620 1                    15D
 2708                          31,2374   77655 1          VAD                 PUSH UP RCLL(UNIT)
 2709                          31,2375   77656 1          UNIT
 2710  REF  2  LAST  118       31,2376   27643 C          STOVL     UCLSTAR
 2711  REF  3  LAST  614       31,2377   03635 1                    VZC
 2712                          31,2400   52342 C          VSR2      VSU
 2713  REF  2  LAST   86       31,2401   02141 1                    VESQ
 2714                          31,2402   54361 1          VXSC      VSR
 2715  REF  2  LAST  614       31,2403   23030 C                    ONE/C
 2716                          31,2404   20616 1                    13D
 2717                          31,2405   53455 C          VAD       UNIT
 2718  REF  1                  31,2406   02617 C                    US
 2719  REF  2  LAST  118       31,2407   03651 0          STORE     USSTAR
 2720                          31,2410   72441 0          DOT       SL1
 2721  REF  3  LAST  614       31,2411   03643 0                    UCLSTAR
 2722                          31,2412   77206 0          PUSH      VLOAD     PD 0,1 = USSTAR(DOT)UCLSTAR
 2723  REF  4  LAST  614       31,2413   03643 0                    UCLSTAR
 2724                          31,2414   57561 1          VXSC      VCOMP
 2725                          31,2415   53372 1          VSL1      VAD
 2726  REF  3  LAST  614       31,2416   03651 0                    USSTAR
 2727                          31,2417   77656 1          UNIT
 2728  REF 17  LAST  603       31,2420   27502 C          STOVL     BVECTOR   USSTAR - COSQ(UCLSTAR
 2729  REF 16  LAST  595       31,2421   15332 1                    ZEROVECS
 2730  REF 18  LAST  614       31,2422   03510 C          STORE     BVECTOR +6
 2731  REF 19  LAST  614       31,2423   17516 C          STODL     BVECTOR +12D
 2732                          31,2424   00001 0                    0
 2733                          31,2425   57526 1          ACOS      DCOMP
 2734                          31,2426   71206 C          PUSH      DLOAD
2734C5 REF 17  LAST  614       31,2427   15332 1                    ZEROVECS
27341                          31,2430   77776 1          EXIT
27342  REF  1                  31,2431   3 3041 1         CA        VARSUBL   PUT FIXED INTO ERASABLE FOR MSU
27344  REF 63  LAST  559       31,2432   54 001 1         TS        L         INSTRUCTION COMING UP
 2735  REF  2  LAST  611       31,2433   3 1754 C         CA        TRUNION   REQUIRED TO CHANGE 2:S COMPLEMENT
27351                          31,2434   0 0006 1         EXTEND              TRUNION TO 1:S COMPLEMENT
27352  REF 64  LAST  614       31,2435   20 001 1         MSU       L         TRUNION(2'S)-00000 CONVERTS TRUNION TO
27353  REF 26C LAST  609       31,2436   54 154 C         TS        MPAC      1:S. VARSUBL=00000
27354  REF 122 LAST  612       31,2437   0 6006 1         TC        INTPRET
27355                          31,2440   67206 1          PUSH      SLOAD     PUSH IS DP. WHEN BDSU IS EXECUTED, 2ND
27356  REF  2  LAST  559       31,2441   01343 1                    TRUNBIAS  HALF OF PUSHLIST IS GUARANTEED ZERO FROM
27357                          31,2442   77621 1          BDSU                DLOAD ZEROVECS ABOVE
 2736                          31,2443   43242 1          SR3       DAD
 2737                          31,2444   41215 1          DAD       DMP
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2738  REF   1                31,2445  23036 C                TRUN19
2739                           31,2446  00041 1                32D
2740                           31,2447  52405 1          DMP   SL3
2741  REF   2  LAST  564      31,2450  07107 C                PI/4.0
2742                           31,2451  62414 1          BOFF  SL2
2743  REF  17  LAST  598      31,2452  04343 1                CMOONFLG
2744  REF   1                31,2453  62454 C                R23.51
2745  REF   4  LAST  571      31,2454  17524 1  R23.51  STODL DELTAQ
2746                           31,2455  00037 C                30D             RCLL * RCLL
2747                           31,2456  47005 1          DMP   RTB
2748  REF   1                31,2457  23045 1                TRUNVAR
2749  REF   1                31,2460  45562 1                TPMODE
27491                          31,2461  77771 C          TAD
27492 REF   2  LAST  614      31,2462  23042 C                VARSUBL
2750  REF  11  LAST  594      31,2463  03526 C          STORE VARIANCE
2751                           31,2464  45014 C          CLEAR CALL
2752  REF   7  LAST  594      31,2465  02666 C                DMENFLG
2753  REF   3  LAST  594      31,2466  75250 1                INCORP1
27531                          31,2467  77624 1          CALL
27532 REF  17  LAST  602      31,2470  56712 C                GRP2PC
2754                           31,2471  51575 1          VLOAD ABVAL
2755  REF  10  LAST  603      31,2472  01265 1                DELTAX +6
2756                           31,2473  60414 C          BOF   SR2             DISPLAY IS 2-27 IF IN LUNAR SPHERE
2757  REF  18  LAST  615      31,2474  04343 1                CMOONFLG
2758  REF   1                31,2475  62476 C                R23.52
2759  REF  11  LAST  595      31,2476  27504 C  R23.52  STOVL N49DISP +2
2760  REF  11  LAST  615      31,2477  01257 C                DELTAX
2761                           31,2500  77646 C          ABVAL
2762                           31,2501  60414 C          BOF   SR2
2763  REF  19  LAST  615      31,2502  04343 1                CMOONFLG
2764  REF   1                31,2503  62504 1                R23.53
2765  REF  12  LAST  615      31,2504  03502 C  R23.53  STORE N49DISP
2766                           31,2505  77776 1          EXIT
2767  REF   1                31,2506  3 3046 C  R23.6  CAF   V6N49
2768  REF 193  LAST  611      31,2507  0 4555 C         TC    BANKCALL
2769  REF  10  LAST  595      31,2510   20763 1         CADR  GOFLASHR
2770  REF   1                31,2511  0 2506 C         TC    R23.6           DONT ALLOW
2771  REF   1                31,2512  0 2521 C         TC    R23.7           INCORPORATE DATA
2772  REF   1                31,2513  0 2047 C         TC    P23.00          RECYCLE FOR ANOTHER MARK
2773  REF  21  LAST  595      31,2514  3 4710 C         CAF   BIT3            BLANK OUT R3
2774  REF  12  LAST  595      31,2515  0 5415 1         TC    BLANKET
27741 REF  38  LAST  612      31,2516  0 5301 C         TC    PHASCHNG
27742                          31,2517   00012 1         OCT   00012
2775  REF  76  LAST  595      31,2520  0 5112 C         TC    ENDOFJOB
2776  REF 123  LAST  614      31,2521  0 6006 1  R23.7  TC    INTPRET
2777                           31,2522   45014 C  R23.8  SET   CALL
2778  REF  12  LAST  594      31,2523   00467 1                VEHUPFLG
2779  REF   3  LAST  595      31,2524   75460 1                INCORP2
2780                           31,2525   77776 1          EXIT
2781  REF  32  LAST  611      31,2526  0 4106 1  R23.END TC    GOTOPOOH
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2783                          31,2527  40220 C  HORIZ    STQ     SETPD
2784  REF   1                31,2530  03672 1           SRRETURN
2785                          31,2531  00001 C           0
2786                          31,2532  65345 C           DLOAD   PDDL          PUSH 0-1 = -AYC SCALED 80
2787  REF   1                31,2533  01714 1           -AYC
2788  REF   1                31,2534  01716 C           AXC
2789                          31,2535  63325 0           PDDL    PDVL          PUSH 2-3 = +AX SCALED 80
2790  REF   8  LAST  542      31,2536  15340 1           DPPOSMAX
2791  REF   2  LAST  614      31,2537  02617 0           US
2792                          31,2540  53435 C           VXV     UNIT
2793  REF   4  LAST  613      31,2541  03627 1           RZC
2794  REF   2  LAST  118      31,2542  27621 1           STOVL   UBAR2
2795                          31,2543  53435 0           VXV     UNIT          PUSH UP
2796  REF   3  LAST  616      31,2544  03621 1           UBAR2
2797  REF   2  LAST  118      31,2545  27605 1           STOVL   UBARO
2798  REF   4  LAST  616      31,2546  03621 1           UBAR2
2799                          31,2547  53435 C           VXV     UNIT
2800  REF   3  LAST  616      31,2550  03605 1           UBARO
2801  REF   2  LAST  118      31,2551  03613 0           STORE   UBAR1
2802                          31,2552  50214 C           BON     DOT
2803  REF  13  LAST  609      31,2553  01703 1           LUNAFLAG
2804  REF   1                31,2554  62752 C           HORIZ.6
2805                          31,2555  00001 0           0             UBAR1 DOT UZ
2806  REF   7  LAST  597      31,2556  36156 C           STCALL  ALPHAV +4
2807  REF   1                31,2557  26437 0           GETERAD
2808                          31,2560  65215 1           DAD     PDDL          MPAC HAS RADIUS OF FISHER SLLIPSOID
2809  REF   1                31,2561  01355 0           HORIZALT      PUSH 0-1 = RH SCALED 829
2810  REF   1                31,2562  23032 1           AEARTH
2811                          31,2563  41415 1           DAD     PUSH          PUSH 2-3 = AH 829
2812  REF   2  LAST  616      31,2564  01355 0           HORIZALT
2813                          31,2565  64375 1  HORIZ.1  VLOAD   MXV
2814  REF   5  LAST  616      31,2566  03627 1           RZC           829
2815  REF   4  LAST  616      31,2567  03605 1           UBARO         81
2816                          31,2570  63372 1           VSL1    PDVL          PUSH 4-9 = RH(XH,YH,ZH) 829
2817  REF   3  LAST  616      31,2571  02617 0           US
2818                          31,2572  76521 C           MXV     VSL1
2819  REF   5  LAST  616      31,2573  03605 1           UBARO
2820                          31,2574  77725 1           PDDL                  PUSH 10-15 = USH 81
2821                          31,2575  00003 1                   2             AH
2822                          31,2576  14043 C           STODL   34D
2823                          31,2577  00005 1                   4             XH
2824                          31,2600  77624 1           CALL
2825  REF   1                31,2601  62756 1                   DIVIDE
2826                          31,2602  41257 1           SR*     DMP
2827                          31,2603  20611 0                   8D,1          NOW SCALED 89
2828  REF 261  LAST  614      31,2604  00155 C                   MPAC
2829                          31,2605  14037 C           STODL   30D
2830                          31,2606  00001 0                   0
2831                          31,2607  14043 C           STODL   34D
2832                          31,2610  00007 C                   6             YH
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2833                          31,2611  77624 1        CALL
2834  REF   2  LAST  616     31,2612  62756 1               DIVIDE
2835                          31,2613  41257 1        SR*    DMP
2836                          31,2614  20611 C               8D,1          B9
2837  REF 262  LAST  616      31,2615  00155 C               MPAC          B18
2838                          31,2616  41415 1        DAD    PUSH          PUSH 16-17 =A SCALED  B18
2839                          31,2617  00037 C               30D
2840                          31,2620  75425 C        DSU    SQRT
2841  REF   1                 31,2621  23040 1               1.0B18
2842                          31,2622  77725 1        PDDL                 PUSH 18-19  SQRT(A-1) B9
2843                          31,2623  00021 1               16D
2844                          31,2624  14043 C        STODL  34D
2845                          31,2625  00005 1               4             XH
2846                          31,2626  77624 1        CALL
2847  REF   3  LAST  617      31,2627  62756 1               DIVIDE
2848                          31,2630  65257 1        SR*    PDDL
2849                          31,2631  20622 0               17D,1         PUSH 20-21 = XH/A B29
2850                          31,2632  00007 C               6             YH
2851                          31,2633  77624 1        CALL
2852  REF   4  LAST  617      31,2634  62756 1               DIVIDE
2853                          31,2635  65257 1        SR*    PDDL
2854                          31,2636  20622 0               17D,1         PUSH 22-23 = YH/A B29
2855                          31,2637  00021 1               16D           A
2856                          31,2640  14043 C        STODL  34D
2857                          31,2641  00023 C               18D           SQRT(A-1)
2858                          31,2642  77624 1        CALL
2859  REF   5  LAST  617      31,2643  62756 1               DIVIDE
2860                          31,2644  77657 C        SR*
2861                          31,2645  20611 C               8D,1
2862                          31,2646  14035 1        STODL  28D
2863                          31,2647  00001 0               0             BH
2864                          31,2650  14043 C        STODL  34D
2865                          31,2651  00003 1               2             AH
2866                          31,2652  77624 1        CALL
2867  REF   6  LAST  617      31,2653  62756 1               DIVIDE
2868                          31,2654  41257 1        SR*    DMP           AH/BH  SCALED  B1
2869                          31,2655  20601 1               0,1
2870                          31,2656  00035 1               28D           SQRT(A-1)/A
2871                          31,2657  72405 C        DMP    SL1
2872                          31,2660  00007 0               6             YH
2873                          31,2661  77725 1        PDDL
2874                          31,2662  00003 1               2             AH
2875                          31,2663  14043 C        STODL  34D
2876                          31,2664  00001 0               0
2877                          31,2665  77624 1        CALL
2878  REF   7  LAST  617      31,2666  62756 1               DIVIDE
2879                          31,2667  41257 1        SR*    DMP           BH/AH  SCALED  B1
2880                          31,2670  20601 1               0,1
2881                          31,2671  00035 1               28D           SQRT (A-1)/A
2882                          31,2672  72405 C        DMP    SL1
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2883                                31,2673  00005 1                4          XH
2884                                31,2674  43325 1          PDDL  DAD
2885                                31,2675  00025 0                20D        XH/A
2886                                31,2676  00031 0                24D        ALPHA
2887                                31,2677  45325 1          PDDL  DSU
2888                                31,2700  00027 1                22D        YH/A
2889                                31,2701  00033 1                26D        BETA
2890                                31,2702  40206 1          PUSH  SETPD
2891                                31,2703  00021 1                16D
2892                                31,2704  45345 1          DLOAD DSU
2893                                31,2705  00025 0                20D        XH/A
2894                                31,2706  00031 0                24D        ALPHA
2895                                31,2707  43325 1          PDDL  DAD
2896                                31,2710  00027 1                22D        YH/A
2897                                31,2711  00033 1                26D        BETA
2898                                31,2712  41525 0          PDDL  PUSH
2899  REF  18  LAST  614            31,2713  15332 1                ZEROVECS
2900                                31,2714  24041 1          STOVL 32D        ZERO THIRD COMP. OF T-O VECTOR
2901                                31,2715  00035 1                28D
2902                                31,2716  53451 1          VSU   UNIT
2903                                31,2717  00005 1                4          RH VECTOR
2904                                31,2720  63241 0          DOT   PDVL       PUSH 22-23 A-SUB-ZERO
2905                                31,2721  00013 0                10D        USH VECTOR
2906                                31,2722  00021 1                16D        T1 VECTOR
2907                                31,2723  53451 1          VSU   UNIT
2908                                31,2724  00005 1                4          RH VECTOR
2909                                31,2725  41441 0          DOT   PUSH       PUSH 24-25 A-SUB-ONE
2910                                31,2726  00013 0                10D
2911                                31,2727  50021 1          BDSU  BMN
2912                                31,2730  00027 1                22D        A-SUB-ZERO
2913  REF  1                        31,2731  62740 0                HORIZ.3
2914                                31,2732  77614 1          BON
2915  REF  3  LAST  610             31,2733  00304 0                NORMHOR
2916  REF  1                        31,2734  62744 1                HORIZ.4
2917                                31,2735  52175 0  HORIZ.2  VLOAD GOTO
2918                                31,2736  00035 1                28D        T-O VECTOR
2919  REF  1                        31,2737  62746 0                HORIZ.5
2920                                31,2740  52014 0  HORIZ.3  BON   GOTO
2921  REF  4  LAST  618             31,2741  00304 0                NORMHOR
2922  REF  1                        31,2742  62735 1                HORIZ.2
2923  REF  2  LAST  616             31,2743  62744 1                HORIZ.4
2924                                31,2744  77775 1  HORIZ.4  VLOAD
2925                                31,2745  00021 1                16D        T1 VECTOR
2926                                31,2746  76505 0  HORIZ.5  VXM   VSL1
2927  REF  6  LAST  616             31,2747  03605 1                UBARO
2928                                31,2750  77650 1          GOTO
2929  REF  2  LAST  616             31,2751  03672 1                SRRETURN
2930                                31,2752  41545 0  HORIZ.6  DLOAD PUSH
2931  REF  1                        31,2753  23034 1                RADMCON
2932                                31,2754  52006 0          PUSH  GOTO
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2933   REF  1                 31,2755  62565 C                HORIZ.1
2934                          31,2756  70501 1  DIVIDE  NORM  SR1
2935   REF  24  LAST  594      31,2757  00047 1                X1
2936                          31,2760  14045 C          STODL 36D
2937                          31,2761  00043 C                34D
2938                          31,2762  55301 C          NORM  BDDV
2939   REF  16  LAST  602      31,2763  00051 C                S1
2940                          31,2764  00045 C                36D
2941                          31,2765  43460 1          XSU,1 RVQ
2942   REF  17  LAST  619      31,2766  00050 1                S1
2943                          31,2767  77014 1  RECT.1  BOFF  AXT,2        SR TO SET ZMEASURE = 0 IF MEASUREMENT
2944   REF  20  LAST  619      31,2770  04343 1                CMOONFLG      PLANET AND PRIMARY PLANET ARE THE SAME
2945   REF  1                  31,2771  63001 C                RECT.3        OTHERWISE = 1
2946                          31,2772  77775 1          DEC   -2
2947                          31,2773  77614 1          BOFF                  VEC. AND SCALE B29 AND B7
2948   REF  14  LAST  616      31,2774  01743 C                LUNAFLAG
2949   REF  1                  31,2775  63005 1                RECT.4
2950                          31,2776  52014 C  RECT.2  CLEAR GOTO
2951   REF  2   LAST  612      31,2777  00265 C                ZMEASURE
2952   REF  1                  31,3000  63007 C                RECT.5
2953                          31,3001  43174 1  RECT.3  AXT,2  BOFF
2954                          31,3002  00000 1                0
2955   REF  15  LAST  619      31,3003  01743 C                LUNAFLAG
2956   REF  1                  31,3004  62776 C                RECT.2
2957                          31,3005  77614 1  RECT.4  SET
2958   REF  3   LAST  619      31,3006  00065 1                ZMEASURE
2959                          31,3007  44575 C  RECT.5  VLOAD VSR7
2960   REF  3   LAST  598      31,3010  01573 1                DELTACSM      SCALED B22  OR  B18
2961                          31,3011  53257 1          VSR*  VAD
2962                          31,3012  57176 C                0,2
2963   REF  3   LAST  598      31,3013  01607 1                RCVCSM        SCALED B29  OR  B27
2964                          31,3014  77657 0          VSR*
2965                          31,3015  57176 0                0,2
2966   REF  6   LAST  616      31,3016  27627 1          STOVL RZC           NOW SCALED B29
2967   REF  1                  31,3017  01601 1                NUVCSM        SCALED B3  OR  B-1
2968                          31,3020  53702 1          VSR4  VSR*
2969                          31,3021  57176 C                0,2
2970                          31,3022  53655 1          VAD   VSR*
2971   REF  1                  31,3023  01615 1                VCVCSM        SCALED B7  OR  B5
2972                          31,3024  57176 C                0,2
2973   REF  4   LAST  614      31,3025  03635 1          STORE VZC           NOW SCALED B7
2974                          31,3026  77616 C          RVQ
2975                          31,3027  26305 C  ONE/C   2DEC* .333564049 E-6 B+21*
2975                          31,3030  05432 1
2977                          31,3031  00302 C  AEARTH  2DEC  6378166 B-29   A AXIS OF EARTH(METERS B-29)
2977                          31,3032  24533 1
2978                          31,3033  00065 1  RADMOON 2DEC  1738090 B-29   RADIUS OF MOON IN METERS
2978                          31,3034  01265 1
2979                          31,3035  01604 1  TRUN19  OCT   01604
29791                         31,3036  00000 1  TRUN19A OCT   00000
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2980                          31,3037  00000 1  1.0B18    2DEC    1.0 B-18
2980                          31,3040  02000 0
29805                         31,3041  00000 1  VARSUBL   DEC     0
298055                        31,3042  01505 0  VARSUBL3  2DEC*   3.42S9040 E+6 B-26*
298055                        31,3043  14100 0
29806                         31,3044  00012 1  TRUNVAR   2DEC    2.5 E-9 B+18
29806                         31,3045  27462 1
2981                          31,3046  01461 0  V6N49     VN      0649
2982                          31,3047  01531 1  V6N89     VN      0689
2983                          31,3050  01306 0  V05N70    VN      0570
2984                          31,3051  01307 1  V05N71    VN      0571
2985                          31,3052  00077 1  OCT00077  OCT     00077
2986                          31,3053  00202 1  V50N25P   OCT     00202
2987                          31,3054  00006 1  SPSIX     OCT     00006
2988                          31,3055  10461 0  JCAXIS    2DEC    .268649805      TRACK AXIS
2988                          31,3056  21675 0
2989                          31,3057  00000 1           2DEC    0
2989                          31,3060  00000 1
2990                          31,3061  15375 1           2DEC    .421695725
2990                          31,3062  02004 1
2991  REF   1                 31,3063  62217 1  R60ADRS   CADR    R60CALL +3
2992                          31,3064  77735 0  LUNLMKLD  SLOAD
2994  REF   5  LAST  612      31,3065  02754 0                    IDOFLMK
2995                          31,3066  45230 1           BHIZ    DSU
2996  REF   1                 31,3067  63101 1                    LNLMKEND
2997  REF   6  LAST  602      31,3070  21646 0                    9DWIO
2998                          31,3071  70152 0           SL1     LXC,1
2999  REF 263  LAST  617      31,3072  00154 1                    MPAC
3000                          31,3073  64743 0           DLOAD*  PDDL*
3001  REF   2  LAST  555      31,3074  23705 1                    ALTTAB ,1
3002  REF   2  LAST  556      31,3075  23623 1                    LONGTAB,1
3003                          31,3076  55523 0           PDDL*   VDEF
3004  REF   2  LAST  556      31,3077  23541 0                    LATTAB,1
3005  REF   8  LAST  556      31,3100  01104 0           STORE   LAT
3006                          31,3101  77616 0  LNLMKEND RVQ
3007  REF   1                 14,2000                    SETLOC  RT53
3008                          14,2000                    BANK
3009                          14,2000  43573 1  LOWMEMRY  VLOAD*  RVQ
3010  REF   1                 14,2001  31751 0                    CATLOG,1
3011                             4550                    BLOCK   02
3012                             4550  0 0006 1  GOTOV56   EXTEND                 P20 TERMINATES BY GOTOV56 INSTEAD OF
3013  REF   1                    4551  3 4554 1           DCA     V856CADR         GOTOPOOH
3014  REF   3  LAST  367         4552  1 5122 1           TCF     SUPDXCHZ
3015  REF   4  LAST  207      E7,1777                    EBANK=  WHOCARES
3016  REF   2  LAST  229         4553  02642 0  V856CADR  2CADR   TRACKTRM
3016                             4554  66107 1
3017  REF   1                    4000                    SETLOC  FFTAG2
3018                             4555                    BANK
3019  REF   1                                            COUNT*  $$/P20
5000                          40,3571                    BANK    40
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5001  REF   1                40,3571                        SETLOC ENDPINS1
5002                         40,3571                        BANK
5003  REF   1                                               COUNT* $$/EXTVB
5004  REF 124  LAST  615     40,3571   0 6006 1  V67CALL    TC     INTPRET
5005                         40,3572    77624 1             CALL
5006  REF   1                40,3573    61653 C                    V67WW
5007                         40,3574    77776 1             EXIT
5008  REF   1                40,3575   3 3727 C  V06N99DS  CAF    V06N99A
5009  REF 154  LAST  615     40,3576   0 4555 C             TC     BANKCALL
5010  REF  12  LAST  508     40,3577    20465 1             CADR   GOXDSPF
5011  REF  29  LAST  607     40,3600   1 5423 C             TCF    ENDEXT
5012  REF   1                40,3601   0 3605 1             TC     V06N9933
5013  REF  31  LAST  607     40,3602   0 5435 C             TC     UPFLAG
5014  REF   1                40,3603    00210 1             ADRES  V67FLAG
5015  REF   1                40,3604   0 3575 C             TC     V06N99DS
5016  REF 125  LAST  621     40,3605   0 6006 1  V06N9933   TC     INTPRET
5017                         40,3606    77414 C             BON    EXIT
5018  REF   2  LAST  621     40,3607    04701 C                    V67FLAG
5019                         40,3610    61612 C                    +2
5020  REF  30  LAST  621     40,3611   1 5423 C             TCF    ENDEXT
5021                         40,3612    41345 C             DLOAD  DMP
5022  REF   2  LAST  276     40,3613    02321 C                    WWPOS
5023  REF   1                40,3614    21731 1                    1/SQRT3
5025                         40,3615    71350 1             LXA,1  DLOAD
5026  REF 264  LAST  620     40,3616    00154 1                    MPAC
5027  REF   2  LAST  276     40,3617    02323 1                    WWVEL
5028                         40,3620    73005 C          DMP       LXA,2
5029  REF   2  LAST  621     40,3621    21731 1                    1/SQRT3
5030  REF 265  LAST  621     40,3622    00154 1                    MPAC
5036                         40,3623    45335 C          SLOAD     DSU
5037  REF   2  LAST  276     40,3624    02325 1                    WWDPT
5038  REF   1                40,3625    21733 C                    V67DEC2
5039                         40,3626    51030 C          BHIZ      BPL
5040  REF   1                40,3627    61636 C                    V67WORB
5041  REF   1                40,3630    61643 1                    V67WMID
5043                         40,3631    67130 1          SXA,1     SXA,2
5044  REF   2  LAST  568     40,3632    02000 C                    WRENDPOS
5045  REF   1                40,3633    02001 1                    WRENDVEL
5046                         40,3634    77650 1          GOTO
5047  REF   1                40,3635    61646 1                    V67EXITX
5048                         40,3636    67130 1  V67WORB   SXA,1   SXA,2
5049  REF   2  LAST  589     40,3637    02004 1                    WORBPOS
5050  REF   2  LAST  589     40,3640    02005 C                    WORBVEL
5051                         40,3641    77650 1          GOTO
5052  REF   2  LAST  621     40,3642    61646 1                    V67EXITX
5053                         40,3643    67130 1  V67WMID   SXA,1   SXA,2
5054  REF   2  LAST  612     40,3644    03000 1                    WMIDPOS
5055  REF   1                40,3645    03001 C                    WMIDVEL
5056                         40,3646    43014 C  V67EXITX  CLEAR   CLEAR
5057  REF  10  LAST  612     40,3647    01671 C                    ORBWFLAG
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5058  REF   9 LAST 611  40,3650  02676 1                RENDWFLG
5059                     40,3651  77776 1          EXIT
5060  REF  31 LAST 621   40,3652  1 5423 C         TCF    ENDEXT
5061                     40,3653  40020 1  V67WW   STQ    BOV
5062  REF   8 LAST 598   40,3654  00051 C                 S2
5063                     40,3655  61656 C                 +1
5064                     40,3656  45014 C          CLEAR  CALL
5065  REF   3 LAST 621   40,3657  04661 1                 V67FLAG
5066  REF  17 LAST 593   40,3660  27371 1                 INTSTALL
5067                     40,3661  71331 C          SSP    DLOAD
5068  REF  18 LAST 619   40,3662  00051 C                 S1
5069                     40,3663  00006 1          DEC    6
5070  REF  19 LAST 618   40,3664  15332 1                 ZEROVECS
5071  REF   3 LAST 621   40,3665  02321 C          STORE  WWPOS
5072  REF   3 LAST 621   40,3666  02323 1          STORE  WWVEL
50721 REF   3 LAST 621   40,3667  02325 1          STORE  WWOPT
5073                     40,3670  77770 1          AXT,1
5074                     40,3671  00066 1          DEC    54
5075                     40,3672  47573 C  NXPOSVEL VLOAD* VSQ
5076  REF  55 LAST 608   40,3673  02467 C                 W +54D,1
5077                     40,3674  77615 C          DAD
5078  REF   4 LAST 622   40,3675  02321 C                 WWPOS
5079  REF   5 LAST 622   40,3676  02321 C          STORE  WWPOS
5080                     40,3677  47573 C          VLOAD* VSQ
5081  REF  56 LAST 622   40,3700  02555 C                 W +1C8D,1
5082                     40,3701  77615 C          DAD
5083  REF   4 LAST 622   40,3702  02323 1                 WWVEL
5084  REF   5 LAST 622   40,3703  02323 1          STORE  WWVEL
5085                     40,3704  75500 C          TIX,1  SQRT
5086  REF   1            40,3705  61672 C                 NXPOSVEL
5087  REF   6 LAST 622   40,3706  16323 1          STODL  WWVEL
5088  REF   6 LAST 622   40,3707  02321 C                 WWPOS
5089                     40,3710  77766 C          SQRT
5090  REF   7 LAST 622   40,3711  02321 C          STORE  WWPOS
5091                     40,3712  52000 C          BOV    GOTO
5092                     40,3713  61715 C                 +2
5093  REF   1            40,3714  61721 1                 V67XXX
5094                     40,3715  77745 1          DLOAD
5095  REF   9 LAST 616   40,3716  15340 1                 DPPOSMAX
5096  REF   8 LAST 622   40,3717  02321 C          STORE  WWPOS
5097  REF   7 LAST 622   40,3720  02323 1          STORE  WWVEL
5098                     40,3721  66150 C  V67XXX  LXA,1  SXA,1
5099  REF   9 LAST 622   40,3722  00051 C                 S2
5100  REF  12 LAST 555   40,3723  00052 C                 QPRET
5101                     40,3724  77776 1          EXIT
5102  REF  39 LAST 576   40,3725  0 4574 C         TC     POSTJUMP
5103  REF   2 LAST 258   40,3726  27406 C          CADR   INTWAKE
5104  REF  11 LAST 494   E4,1720           WWPOS   =      RANGE
5105  REF   7 LAST 495   E4,1722           WWVEL   =      RRATE
5106  REF  12 LAST 495   E4,1724           WWOPT   =      RTHETA
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5107                    40,3727   01543 1  V06N99A  VN      0699
5108                    40,3730   22363 1  1/SQRT3  2DEC    0.5773502
5108                    40,3731   11620 0
5109                    40,3732   00002 0  V67DEC2  2DEC    2 B-14
5109                    40,3733   00000 1
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0001                                32,2017                         BANK    32

0002  REF    1                      35,2000                         SETLOC  P30S1
0003                                35,3544                         BANK

0004  REF    8  LAST  553           E7,1625                         EBANK=  +MGA

0005  REF    1                                                      COUNT   35/P34

0006                                35,3544    77420 1  DISPMGA     STQ     EXIT            USED IN P30

0007  REF    2  LAST   89           35,3545    02370 1                     RGEXIT
0008  REF    2  LAST  471           35,3546  0 3564 0                TC      COMPTGO

0009  REF    2  LAST  471           35,3547  3 3132 1  DISP45       CAF     V16N45
0010  REF  155  LAST  621           35,3550  0 4555 0                TC      BANKCALL
0011  REF   11  LAST  615           35,3551    20763 1               CADR    GOFLASHR
0012  REF   33  LAST  615           35,3552  0 4106 1                TC      GOTOPOOH
0013  REF    1                      35,3553  0 3560 1                TC      END45
0014  REF    1                      35,3554  0 3547 1                TC      DISP45
0015  REF   39  LAST  615           35,3555  0 5301 0  P30PHSI       TC      PHASCHNG
0016                                35,3556    00014 1               OCT     14
0017  REF   77  LAST  615           35,3557  0 5112 0                TCR     ENDOFJOB
0018  REF  126  LAST  621           35,3560  0 6006 1  END45        TC      INTPRET
0019                                35,3561    52014 0               CLEAR   GOTO
0020  REF    1                      35,3562    03664 0                       TIMRFLAG
0021  REF    3  LAST  624           35,3563    02370 1                       RGEXIT

0022                                35,3564  0 0006 1  COMPTGO      EXTEND                  USED TO COMPUTE TTOGO
00221 REF    1                      35,3565  23'066 0                QXCH    PHSPRDT6        ** GROUP 6 TEMPORARY USED ,, BEWARE **

00222 REF   32  LAST  621           35,3566  0 5435 0                TC      UPFLAG          SET TIMRFLAG
00223 REF    2  LAST  624           35,3567    00155 0               ADRES   TIMRFLAG        BIT 11 FLAG 7
00224 REF  123  LAST  584           35,3570  3 4714 1                CAF     ZERO
00225 REF    1                      35,3571  55'145 1                TS      NVWORD1

00226                               35,3572  0 0004 0                INHINT
00227 REF   74  LAST  606           35,3573  3 4712 1                CAF     ONE
00228 REF   21  LAST  528           35,3574  0 5140 1                TC      WAITLIST
00229 REF   27  LAST  520           E7,1412                         EBANK=  TIG
0023  REF    3  LAST  212           35,3575    03174 0               2CADR   CLOKTASK
0023                                35,3576    50067 0

00231 REF   11  LAST  608           35,3577  0 5261 1                TC      2PHSCHNG
00232                               35,3600    40036 0               OCT     40036           6.3SPOT FOR CLOKTASK
00233                               35,3601    05024 1               OCT     05024           GROUP 4 CONTINUES HERE
00234                               35,3602    13000 0               OCT     13000

00235 REF    2  LAST  624           35,3603  0 1066 0                TC      PHSPRDT6
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P00239  PROGRAM DESCRIPTION  P30    DATE 3-6-67

R00245  MOD.1 BY S. ZELDIN- TO ADD P31 AND AD APT P30 FOR P31 USE.    22DEC67
R0025   FUNCTIONAL DESCRIPTION
R0026   +3C(E)TERNAL DELTA-V TARGETTING PROGRAM)
R0027       ACCEPTS ASTRONAUT INPUTS OF TIG,DELV(LV) AND COMPUTES,FOR DISPLAY,
R0028       APOGEE,PERIGEE,DELV(MAG),HGA ASSOCIATED WITH DESIRED MANEUVER

R0029   P31(GENERAL LAMBERT AIMPOINT GUIDANCE)
R00291  A GROUND RULE FOR P31 IS THE ANGLE BETWEEN THE TARGET VECTOR AND
R00292  POSITION VECTOR AT TIG IS NOT 165-195 DEGREES APART
R0030       BASED ON STORED INPUT OF OFFSET TARGET(R+29) AND DELTA T TRANS,AND
R0031       ASTRONAUT ENTRY OF TIG,P31 COMPUTES REQUIRED VELOCITY FOR MANEUVER
R0032       AND,FOR DISPLAY,APOGEE,PERIGEE,DELV(MAG),+HGA ASSOCIATED WITH
R0033       DESIRED MANEUVER

R0034       THE FOLLOWING SUBROUTINES ARE USED IN P30 AND P31
R0035          S30.1 (P30 ONLY)
R0036          S31.1 (P31 ONLY)
R0037          P30/P31 - DISPLAYS TIG
R0038          CNTLP30 - DISPLAYS DELV(LV)
R00381         PARAM30 - DISPLAYS APOGEE,PERIGEE,DELV(MAG),HGA,TIME FROM TIG,
R00382                   MARKS SINCE LAST THRUSTING MANEUVER
R00383  CALLING  SEQUENCE VIA JOB FROM V37

R00384  EXIT VIA V37 CALL OR GOTOPOOH

R00385  OUTPUT FOR POWERED FLIGHT
R00386          VTIG   X
R00387          RTIG    XSEE S30.1
R00388          DELVSIN X
R00389          VGOISP
R003891         RTARG  X
R003892         TPASS4  X SEE S31.1
R003893               X
```

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 0039   REF   1                                          COUNT  35/P30

 0039C1 REF   1              35,3604  0 3636 1  P30     TC     P30/P31
 0039C3 REF   1              35,3605  0 3655 1          TC     CNTNUP30
 0039C5 REF  35  LAST  61C   35,3606  0 5447 C          TC     DOWNFLAG      RESET UPDATFLG
 0039C7 REF  13  LAST  574   35,3607   00027 1          ADRES  UPDATFLG      BIT 7  FLAG 1
 0039C9 REF 127  LAST  624   35,3610  0 6006 1          TC     INTPRET
 003911                      35,3611   77624 1          CALL
 003913 REF   1              35,3612   63102 1                 S30.1
 003915                      35,3613   77776 1          EXIT
 003919 REF   1              35,3614  0 3665 1          TC     PARAM30
 003921 REF  33  LAST  624   35,3615  0 5435 C          TC     UPFLAG
```

```
003923 REF   3  LAST  518   35,3616   00045 C          ADRES  XDELVFLG    SET XDELVFLG    BIT 8  FLAG 2
003925 REF  34  LAST  624   35,3617  1 4106 C          TCF    GOTOPOOH

003927 REF   2  LAST  625   35,3620  0 3636 1  P31     TC     P30/P31
003929 REF  36  LAST  625   35,3621  0 5447 C          TC     DOWNFLAG
003931 REF  14  LAST  625   35,3622   00027 1          ADRES  UPDATFLG    RESET UPDATFLG  BIT 7 FLAG 1
003932 REF  37  LAST  626   35,3623  0 5447 C          TC     DOWNFLAG
003933 REF   3  LAST  478   35,3624   00156 C          ADRES  NORMSW      RESET NORMSW       BIT 10  FLAG 7
003934 REF 128  LAST  625   35,3625  0 6006 1          TC     INTPRET
003935              .       35,3626   77624 1          CALL
003937 REF   1              35,3627   63154 1                 S31.1
003939              .       35,3630   77776 1          EXIT
003943 REF   2  LAST  625   35,3631  0 3655 1          TC     CNTNUP30
003945 REF   2  LAST  625   35,3632  0 3665 1          TC     PARAM30
003947 REF  38  LAST  626   35,3633  0 5447 C          TC     DOWNFLAG
003949 REF   4  LAST  626   35,3634   00045 C          ADRES  XDELVFLG    BIT 8  FLAG 2
003951 REF  35  LAST  626   35,3635  1 4106 C          TCF    GOTOPOOH

00396  REF 152  LAST  474   35,3636  56 002 C  P30/P31  XCH    Q
00397  REF   1              35,3637  55'664 C          TS     P30/31RT
0040   REF  34  LAST  625   35,3640  0 5435 C          TC     UPFLAG
00405  REF  15  LAST  626   35,3641   00027 1          ADRES  UPDATFLG    SET UPDATFLG  BIT 7  FLAG 1
0041   REF  35  LAST  626   35,3642  0 5435 C          TC     UPFLAG
00415  REF   5  LAST  574   35,3643   00031 C          ADRES  TRACKFLG    SET TRACKFLG  BIT 5  FLAG 1
0042   REF   1              35,3644  3 3722 C          CAF    V06N33      T OF IGN
0043   REF 156  LAST  624   35,3645  0 4555 C          TC     BANKCALL
0044   REF  12  LAST  624   35,3646   20763 1          CADR   GOFLASHR
0045   REF  36  LAST  626   35,3647  1 4106 C          TCF    GOTOPOOH
00467  REF   2  LAST  626   35,3650  0 1664 1          TC     P30/31RT
0047   REF   3  LAST  626   35,3651  1 3642 C          TCF    P30/P31 +4
0048   REF  40  LAST  624   35,3652  0 5301 C          TC     PHASCHNG
0049                        35,3653   00014 1          OCT    00014
0050   REF  78  LAST  624   35,3654  0 5112 C          TC     ENDOFJOB

00501  REF 153  LAST  626   35,3655  56 002 C  CNTNUP30 XCH    Q
00502  REF   1              35,3656  55'127 C          TS     P30/RET
0051   REF   2  LAST  470   35,3657  3 3131 1          CAF    V06N81
0052   REF 157  LAST  626   35,3660  0 4555 C          TC     BANKCALL
0053   REF  25  LAST  611   35,3661   20624 C          CADR   GOFLASH
0054   REF  37  LAST  626   35,3662  1 4106 C          TCF    GOTOPOOH
0055   REF   2  LAST  626   35,3663  0 1127 1          TC      P30/RET
0056   REF   3  LAST  626   35,3664  1 3657 1          TCF    CNTNUP30 +2
0067   REF 154  LAST  626   35,3665  56 002 C  PARAM30  XCH    Q
00675  REF   3  LAST  626   35,3666  55'664 C          TS     P30/31RT
0068   REF   1              35,3667  3 3723 1          CAF    V06N42
0069   REF 158  LAST  626   35,3670  0 4555 C          TC     BANKCALL
0070   REF  26  LAST  626   35,3671   20624 C          CADR   GOFLASH
0071   REF  38  LAST  626   35,3672  0 4106 1          TC     GOTOPOOH    ON TERMINATION GOTOPOOH
0072   REF   1              35,3673  1 3675 1          TCF    REFTEST     ON PROCEED GO DO REFTEST
```

```
0073  REF   3  LAST  626   35,3674   1 3667 1            TCF     PARAM30 +2
0074  REF  19  LAST  552   35,3675   3 4676 1  REFTEST   CAF     BIT13
0075  REF  36  LAST  576   35,3676   7 0077 0            MASK    STATE +3        REFSMFLAG
0076                       35,3677   0 0006 1            EXTEND
0077  REF   1               35,3700   1 3710 0            BZF     NOTSET          REFSMFLAG =0 , THEN BRANCH TO NOTSET
0078  REF 129  LAST  626   35,3701   0 6006 1            TC      INTPRET
0079                       35,3702    41575 0            VLOAD   PUSH
0080  REF   6  LAST  518   35,3703    03646 0                    DELVSIN
0081                       35,3704    77624 1            CALL
0082  REF   3  LAST  483   35,3705    10660 0                    GET+MGA
0084                       35,3706    77650 1            GOTO
0085  REF   1               35,3707    73714 1                    FLASHMGA
0086                       35,3710   0 0006 1  NOTSET    EXTEND
0087  REF   1               35,3711   4 3721 1            DCS     MARSDP
0088  REF   9  LAST  624   35,3712   53'626 0            DXCH    +MGA            +MGA, +MGA+1  CONTAINS (-00001)
0089  REF 130  LAST  627   35,3713   0 6006 1            TC      INTPRET
0090                       35,3714    77624 1  FLASHMGA  CALL
0091  REF   1               35,3715    73544 0                    DISPMGA
0092                       35,3716    77776 1            EXIT
00935 REF   4  LAST  626   35,3717   0 1664 1            TC      P30/31RT
0097                       35,3720    00000 1  MARSDP    OCT     00000           (00000) (16440)  = (+00001)
0098                       35,3721    35100 0            OCT     35100
A0099                                                             ( .01 ) DEGREES IN THE LOW ORDER REGISTE
0100                       35,3722    01441 1  V06N33    VN      0633
0102                       35,3723    01452 0  V06N42    VN      0642
0103                       35,3724    04043 1  V16N35    VN      1635
0104                       35,3725    01455 1  V06N45    VN      0645
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L P30,P37 USER'S PAGE NO. 5 E7 S3

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R0105   PROGRAM DESCRIPTION S30.1       DATE 9NOV66

R0106   MOD NO 1          LOC SECTION  P30,P37
R0107   MOD  BY  RAMA AIYAWAR **
R0107S  MOD.2 BY S.ZELDIN - TO CORRECT MOD.1 FOR COLOSSUS          29DEC67
R0108   FUNCTIONAL DESCRIPTION
R0109            BASED ON STORED TARGET PARAMETERS(R OF IGNITION(RTIG),V OF
R0110   IGNITION(VTIG),TIME OF IGNITION(TIG),DELV(LV),COMPUTE PERIGEE ALTITUDE
R0111   APOGEE ALTITUDE AND DELTA-V REQUIRED IN REF. COORDS.(DELVSIN)
R0112   CALLING SEQUENCE
R0113       L    CALL
R0114       L+1          S30.1
R0115   NORMAL EXIT MODE
R0116       AT L+2 OR CALLING SEQUENCE (GOTO L+2)
R0117   SUBROUTINES CALLED
R0118            THISPREC
R0119            PERIAPO
R0120   ALARM OR ABORT EXIT MODES
R0121                  NONE
R0122   ERASABLE INITIALIZATION REQUIRED
R0123            TIG        TIME OF IGNITION                    DP      B28CS
R0124            DELVSLV    SPECIFIED DELTA-V IN LOCAL VERT.
R0125                       COORDS. OF ACTIVE VEHICLE AT
R0126            TIME OF IGNITION                          VCT.    B+7M/CS
R0127   OUTPUT
R0128            RTIG       POSITION AT TIG                VCT.    B+29M
R0129            VTIG       VELOCITY AT TIG                VCT.    B+7M
R0130            HAPO       APOGEE ALT.                    DP      B+29M
R0131            HPER       PERIGEE ALT.                   DP      B+29M
R0132            DELVSIN    DELVSLV IN REF COORDS          VCT.    B+7M/CS
R0133            VCDISP     MAG. OF DELVSIN                DP      B+7M/CS
R0136   DEBRIS QTEMP    TEMP. ERASABLE
R0137            QPRET,MPAC
R0138            PUSHLIST

 0139   REF   1                31,2000                    SETLOC P30S1A
 0140                           31,3102                    BANK

 0141   REF   1                                           COUNT  35/S3CS

 0142                           31,3102   71220 1  S30.1   STQ    DLOAD
 0143   REF   4  LAST  546     31,3103   03657 0           QTEMP
 0144   REF  28  LAST  624     31,3104   03413 1           TIG          TIME IGNITION SCALED AT 2(+28)CS
 0145   REF  32  LAST  596     31,3105   34041 0           STCALL TDEC1
 0146   REF   5  LAST  506     31,3106   27022 1           THISPREC     ENCKE ROUTINE FOR

 0147                           31,3107   67175 0           VLOAD  SXA,2
 0148   REF  16  LAST  584     31,3110   00007 0           VATT
 0148S  REF  11  LAST  526     31,3111   03746 1           RTX2
 0149   REF   2  LAST  120     31,3112   27640 0           STOVL  VTIG
```

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0150   REF  20  LAST  584   31,3113   00001 C            RATT
0151   REF   3  LAST  12C   31,3114   03632 C     STORE  RTIG
0152   REF  25  LAST  545   31,3115   03540 C     STORE  RACT3
0153                        31,3116   53435 C     VXV    UNIT
0154   REF   3  LAST  628   31,3117   03640 C            VTIG
0155   REF   9  LAST  469   31,3120   36617 1     STCALL UNRM
0156   REF   3  LAST  467   31,3121   72667 C            LOMAT
0157                        31,3122   61375 1     VLOAD  VXM
0158   REF   4  LAST  17C   31,3123   03405 C            DELVSLV
0159                        31,3124   00001 C            0
0160                        31,3125   66172 C     VSL1   SXA,1
0161   REF   9  LAST  543   31,3126   03745 1            RTX1
0162   REF   7  LAST  627   31,3127   03646 C     STORE  DELVSIN
0163                        31,3130   77646 C     ABVAL
0164   REF   4  LAST  274   31,3131   27654 C     STCVL  VGDISP        MAG DELV
0165   REF   4  LAST  629   31,3132   03632 C            RTIG
0166                        31,3133   53315 C     PDVL   VAD
0167   REF   8  LAST  629   31,3134   03646 C            DELVSIN
0168   REF   4  LAST  629   31,3135   03640 C            VTIG
0169                        31,3136   77624 1     CALL
0170   REF   3  LAST  518   31,3137   45312 C            PERIAPO1
0171                        31,3140   77624 1     CALL
0172   REF   3  LAST  518   31,3141   45422 1            SHIFTR1
01725                       31,3142   77624 1     CALL
01726  REF   3  LAST  511   31,3143   46754 C            MAXCHK
0173   REF   2  LAST  272   31,3144   16366 C     STODL  HPER          PERIGEE ALT B+29
0174                        31,3145   00005 1            4D
0175                        31,3146   77624 1     CALL
0176   REF   4  LAST  629   31,3147   45422 1            SHIFTR1
01765                       31,3150   77624 1     CALL
01766  REF   4  LAST  629   31,3151   46754 C            MAXCHK
0177   REF   4  LAST  272   31,3152   36364 C     STCALL HAPO          APOGEE ALT B+29
0178   REF   5  LAST  628   31,3153   03657 C            QTEMP
```

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P0181   S31.1  PROGRAM DESCRIPTION                    28DEC67
R0182   MCC.1 BY S.ZELDIN

R0183   S31.1 COMPUTES DELV IN REF AND LV COORDS,MAG OF DELV,INTERCEPT TIME,
R0184   APOGEE AND PERIGEE ALT FOR REQUIRED MANEUVER

R0185   CALLING SEQUENCE
R0186           L       CALL
R0187         L +1              S31.1

R0188   NORMAL EXIT MODE
R0189           AT L +2 OF CALLING SEQUENCE(GOTO L+2)
R0190   SUBROUTINES CALLED
R0191            AGAIN
R0192            PERIAPO1
R0193            SHIFTR1
R0194            MIDGIN
R0195   NO ALARM OR ABORT MODES
R0196   INPUT
R0197            DELLT4              DP  +28
R0198            TIG                 DP  +28
R01981           RTARG               VCT +29
R01982  OUTPUT
R01983           DELVLVC             VCT +7
R01984           VGDISP              DP  +7
R01985           HAPO                DP  +29
R01986           HPER                DP  +29
R01987           TPASS4              DP  +28
R01988  DEBRIS - QTEMP
 0200                          31,3154   71220 1  S31.1    STQ     DLOAD
 0201   REF   6  LAST  629     31,3155   03657 0            QTEMP
 0202   REF  29  LAST  628     31,3156   03413 1            TIG
 0203   REF  33  LAST  628     31,3157   34041 0            STCALL  TDEC1
 0204   REF   1                31,3160   61663 0            AGAIN   RETURNS RTX2,RTX1,RATT,VATT,VIPRIME
 0205                          31,3161   63375 0            VLOAD   PDVL    DELVEET3
 0206   REF   5  LAST  629     31,3162   03632 0            RTIG
 0207   REF  12  LAST  545     31,3163   03612 1            VIPRIME
 0208                          31,3164   77624 1            CALL
 0209   REF   4  LAST  629     31,3165   45312 0            PERIAPO1
 0210                          31,3166   77624 1            CALL
 0211   REF   5  LAST  629     31,3167   45422 1            SHIFTR1
 02115                         31,3170   77624 1            CALL
 02116  REF   5  LAST  629     31,3171   46754 0            MAXCHK
 0212   REF   3  LAST  629     31,3172   16366 0            STODL   HPER    B29
 0213                          31,3173   00005 1            4D
 0214                          31,3174   77624 1            CALL
 0215   REF   6  LAST  630     31,3175   45422 1            SHIFTR1
 02155                         31,3176   77624 1            CALL
 02156  REF   6  LAST  630     31,3177   46754 0            MAXCHK
 0216   REF   5  LAST  629     31,3200   26364 1            STOVL   HAPO    B29
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0217   REF  15  LAST  543   31,3201  03646 0          DELVEET3
02175                       31,3202  00001 0  STORE   0
0218                        31,3203  45014 0  SET     CALL
0219   REF   6  LAST  542   31,3204  01072 0          AVFLAG
0220   REF   1              31,3205  10653 0          MIDGIN      GET DELVLVC B7 FORDISPLAY
0221                        31,3206  77646 0  ABVAL
0222   REF   5  LAST  629   31,3207  17654 0  STODL   VGDISP      B+7 FOR DISPLAY
0223   REF   8  LAST  543   31,3210  03423 1          DELLT4
0224                        31,3211  77615 0  DAD
0225   REF  30  LAST  630   31,3212  03413 1          TIG
0226   REF   8  LAST  467   31,3213  37656 0  STCALL  TPASS4      FOR S40.1
0227   REF   7  LAST  630   31,3214  03657 0          QTEMP
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R0327   SUBROUTINE NAME:      DELRSPL                                  (CONTINUATION OF V 82 IN CSM IF P11 ACTI
R0329   TRANSFERRED COMPLETELY FROM SUNDISK, P30S REV 33. 9 SEPT 67.
R0330   MOD NO:  0           MOD BY:  ZELDIN              DATE:
R0331   MOD NO:  1           MOD BY:  RR BAIRNSFATHER     DATE:  11 APR 67
R0332   MOD NO:  2           MOD BY:  RR BAIRNSFATHER     DATE:  12 MAY 67    ADD UR.RT CALC WHEN BELOW 300K FT
R0334   MOD NO:  2.1         MOD BY:  RR BAIRNSFATHER     DATE: 5 JULY 67     FIX ERROR IN MOD. 2.
R0336   MOD NO:  3           MOD BY:  RR BAIRNSFATHER     DATE:  12 JUL 67    CHANGE SIGN OF DISPLAYED ERROR.
R03371  MOD 4                MOD BY   S.ZELDIN            DATE  3 APRIL 68    CHANGE EQUATIONS FOR L/D=.18 WHICH REPLA
R0338   FUNCTION:            CALCULATE (FOR DISPLAY ON CALL) AN APPROXIMATE    MEASURE OF IN-PLANE SPLASH DOWN
R0340                        ERROR. IF THE FREE-FALL TRANSFER ANGLE TO 300K FT  ABOVE PAD RADIUS IS POSITIVE:
R0342                        SPLASH ERROR= -RANGE TO TARGET + FREE-FALL TRANSFER ANGLE + ESTIMATED ENTRY ANGLE.
R0344                        THE TARGET LOCATION AT ESTIMATED TIME OF IMPACT IS USED.  IF THE FREE-FALL TRANSFER
R0346                        ANGLE IS NEGATIVE:  SPLASH ERROR= -RANGE TO TARGET
R0347                        THE PRESENT TARGET LOCATION IS USED.
R0348   CALLING SEQUENCE     CALLED AFTER SR30.1 IF IN CSM AND IF P11 OPERATING (UNDER CONTROL OF V82)
R0349   SUBROUTINES CALLED: VGAMCALC, TFF/TRIG, LALOTORV.
R0350   EXIT                RETURN DIRECTLY TO V 82 PROG. AT SPLRET
R0351   ERASABLE INITIALIZATION   LEFT BY SR30.1 AND V82GON1
R0352   OUTPUT:  RSP-RREC  RANGE IN REVOLUTIONS                          DSKY DISPLAY IN N. MI.
R0354   DEBRIS:  GPRET, PDL0 ...PDL7 ,PDL10

R03541          THETA(1)
R0355
0356                        32,2017                 BANK    32
0357    REF  1              32,2000                 SETLOC  DELRSPL1
0358                        32,2017                 BANK
0359    REF  1                                      COUNT*  $$/P30        PROGRAMS: P30 EXTERNAL DELTA V

0360                        32,2017  00011 1  DELRSPL STORE  8D
0361                        32,2020  45244 1          BPL     DSU
0362    REF  1              32,2021  64063 0          CANTOO  GONE PAST 300K FT ALT
0363    REF  1              32,2022  16326 1          1BITOP
0364                        32,2023  45000 0          BOV     CALL
0365    REF  2  LAST  632   32,2024  64063 0          CANTOO  POSMAX INDICATES NO 300K FT SOLUTION.
0366    REF  1              32,2025  55050 1          VGAMCALC +GAMMA(REV) IN PMAC,V300 MAG(8-7)=PDL 0
0367                        32,2026  45006 0          PUSH    CALL
0368    REF  1              32,2027  56573 0          TFF/TRIG
0369                        32,2030  77624 1          CALL
0370    REF  1              32,2031  64071 0          AUGEKUGL
0371                        32,2032  65525 0          PDDL    ACOS    T ENTRY PDL 6
0372    REF  1              32,2033  00017 1          CDELF/2
0373                        32,2034  77615 0          DAD
0374                        32,2035  00005 1          4
0375    REF  2  LAST   88   32,2036  26350 0  GETARG  STOVL  THETA(1)
0376    REF  7  LAST  432   32,2037  03401 1          LAT(SPL)
0377    REF  9  LAST  620   32,2040  15104 0          STODL   LAT
0378    REF 10  LAST  602   32,2041  15332 1          HI6ZEROS
0379    REF  6  LAST  599   32,2042  15110 0          STODL   ALT     ALT=0  = LAT +4
0381                        32,2043  43225 0          DSU     DAD
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 0382                                32,2044  00011 1                 8D
 0383  REF  5  LAST  498              32,2045  01205 1                 PIPTIME
 0384                                32,2046  45014 C         CLEAR   CALL
 0385  REF  6  LAST  612              32,2047  00662 C                 ERADFLAG
 0386  REF  4  LAST  612              32,2050  26373 1                 LALOTORV        R RECOV. IN ALPHAV AND MPAC

 0387                                32,2051  63256 C         UNIT    PDVL
 0388  REF 14  LAST  511              32,2052  02327 C                 RONE
 03881                               32,2053  50256 C         UNIT    DOT
 0389                                32,2054  65552 C         SL1     ARCCOS
 0390                                32,2055  77621 1         BDSU                    ERROR = THETA EST - THETA TARG
A0391                                                                   NEGATIVE NUMBER SIGNIFIES THAT WILL FALL SHORT.
A0392                                                                   POSITIVE NUMBER SIGNIFIES THAT WILL OVERSHOOT.
 0393  REF  3  LAST  632              32,2056  02350 C                 THETA(1)
 0394  REF  3  LAST  273              32,2057  36356 1 DELRDONE STCALL RSP-RREC        DOWNRANGE RECOVERY RANGE ERROR    /360
 03941 REF  1                        32,2060  27404 1                 INTWAKEO
 03942                               32,2061  77624 1         CALL
 0395  REF  1                        32,2062  46653 C                 SPLRET
 0396                                32,2063  65345 C CANTDO  DLOAD   PDDL            INITIALIZE ERASE TO DOT TARGET AND UR
A0397                                                                   FOR RANGE ANGLE.
 0398  REF  7  LAST  597              32,2064  15330 C                 HIDPHALF        TO PDL 0 FOR DEN IN DDV.
 0399  REF 11  LAST  632              32,2065  15332 1                 HI6ZEROS
 0400                                32,2066  77606 1         PUSH                    ZERO TO PDL 2 FOR PHI ENTRY
 0401                                32,2067  34011 C         STCALL  8D
 0402  REF  1                        32,2070  64036 C                 GETARG          GO SET RSP-RREC =0

 0405                                32,2071  77775 1 AUGEKUGL VLOAD
 0406  REF  1                        32,2072  24245 1                 X1CON -2
 0407  REF 25  LAST  619              32,2073  14045 C         STODL   X1 -2
 0408                                32,2074  00001 C                 0
 0409                                32,2075  50025 C         DSU     BMN
 0410  REF  1                        32,2076  24237 1                 V(21K)
 0411  REF  1                        32,2077  64124 1                 LOOPSET
 0412                                32,2100  65060 1         XSU,1   XCHX,2
 0413  REF 19  LAST  622              32,2101  00050 1                 S1
 0414  REF 26  LAST  633              32,2102  00046 C                 X1
 0415                                32,2103  45324 C         XCHX,2  DSU
 0416  REF 20  LAST  633              32,2104  00050 1                 S1
 0417  REF  1                        32,2105  24225 1                 V(3K)
 0418                                32,2106  65040 C         BMN     XCHX,2
 0419  REF  2  LAST  633              32,2107  64124 1                 LOOPSET
 0420  REF 21  LAST  633              32,2110  00050 1                 S1
 0421                                32,2111  50025 C         DSU     BMN
 0422  REF  1                        32,2112  24235 C                 V(4K)
 0423  REF  3  LAST  633              32,2113  64124 1                 LOOPSET
 0424                                32,2114  65124 C         XCHX,2  XCHX,2
 0425  REF 22  LAST  633              32,2115  00050 1                 S1
 0426  REF 27  LAST  633              32,2116  00046 C                 X1
 0427                                32,2117  50025 C         DSU     BMN
 0428  REF  1                        32,2120  24221 C                 V(40C)
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0429  REF  4 LAST 633  32,2121  64124 1            LOOPSET
0430                   32,2122  77730 0       SXA,1
0431  REF 23 LAST 633  32,2123  00050 1            S1
0432                   32,2124  52110 0 LOOPSET INCR,1 GOTO
0433                   32,2125  00001 0       DEC  1
0434  REF  1           32,2126  64131 0            K1K2LOOP
0435                   32,2127  77730 0 K2CALC SXA,1
0436  REF 24 LAST 634  32,2130  00050 1            S1
0437                   32,2131  44745 1 K1K2LOOP DLOAD DSU*
0438                   32,2132  00001 0            0
0439  REF  1           32,2133  24234 1            V(32K) +1,1
0440                   32,2134  42603 1       DMP* DAD*
0441  REF  1           32,2135  24220 1            YK1K2 +1,1
0442  REF  1           32,2136  24204 1            CK1K2 +1,1
0443                   32,2137  60125 1       PDDL TIX,1
0444                   32,2140  00003 1            2
0445  REF  1           32,2141  64127 1            K2CALC
0446                   32,2142  55225 1       DSU  BDDV
04461                  32,2143  50000 1       BDV  BMN
04462 REF  1           32,2144  64163 1            MAXPHI
04463 REF  2 LAST 634  32,2145  64163 1            MAXPHI
0447                   32,2146  45325 1 PHICALC PDDL DSU          PHI ENTRY PDL 4D
0448                   32,2147  00001 0            0
0449  REF  1           32,2150  24245 1            V(26K)
0450                   32,2151  71244 0       BPL  DLOAD
0451  REF  1           32,2152  64160 1            TGR26
0452  REF  1           32,2153  24241 0            TLESS26
0453                   32,2154  77671 1       DDV
0454                   32,2155  00001 0            0
0455                   32,2156  43405 1 TENT  DMP  RVQ
0456                   32,2157  00005 1            4D
0457                   32,2160  52145 0 TGR26 DLOAD GOTO
0458  REF  1           32,2161  24243 1            TGR26CON
0459  REF  1           32,2162  64156 1            TENT

04591                  32,2163  52145 0 MAXPHI DLOAD GOTO
04592 REF  1           32,2164  24167 1            MAXPHIC
04593 REF  1           32,2165  64146 0            PHICALC
04594                  32,2166  02755 1 MAXPHIC 2DEC .09259298    2000 NM FOR MAXIMUM PHI ENTRY
04594                  32,2167  01307 1
0460  REF  2 LAST 632 TO 634:  105  105*      COUNT* $$/P30

A0461                                                        BELOW
A0462                                          <<<< TABLE IS INDEXED. KEEP IN ORDER >>>

0463                   32,2170  00013 0       2DEC 7.07304526 E-4  5500
0463                   32,2171  22652 0
0464                   32,2172  00005 1       2DEC 3.08641975 E-4  2400
0464                   32,2173  01642 0
```

```
0465                32,2174  00005 1          2DEC   3.08641975 E-4  2400
0465                32,2175  01642 0
0466                32,2176  77556 1          2DEC   -8.8888888 E-3  -3.2
0466                32,2177  53522 1
0467                32,2200  00055 1          2DEC   2.7777777 E-3   1
0467                32,2201  20266 1
0468                32,2202  00155 0  CK1K2    2DEC   6.6666666 E-3   2.4
0468                32,2203  07202 0
0469                32,2204  00000 1          2DEC   0               0
0469                32,2205  00000 1
0470                32,2206  77730 0          2DEC*  -1.86909989 E-5 B7*      -.443
0470                32,2207  71525 0
0471                32,2210  00000 1          2DEC   0
0471                32,2211  00000 1
0472                32,2212  04445 0          2DEC*  1.11639691 E-3 B7*      .001225
0472                32,2213  10102 0
0473                32,2214  03726 1          2DEC*  9.56911636 E-4 B7*      .00105
0473                32,2215  31201 0
0474                32,2216  01040 1  YK1K2    2DEC*  2.59733157 E-4 B7*           .000285
0474                32,2217  26313 1
0475                32,2220  00234 1  V(400)   2DEC   1.2192 B-7
0475                32,2221  01660 0
0476                32,2222  25254 0  V(28K)   2DEC   85.344 B-7
0476                32,2223  01014 0
0477                32,2224  02222 1  V(3K)    2DEC   9.144 B-7
0477                32,2225  15646 1
0478                32,2226  22223 1  V(24K)   2DEC   73.152 B-7
0478                32,2227  16457 0
0479                32,2230  25254 0          2DEC   85.344 B-7
0479                32,2231  01014 0
0480                32,2232  30304 0  V(32K)   2DEC   97.536 B-7
0480                32,2233  23351 1
0481                32,2234  03030 1  V(4K)    2DEC   12.192 B-7
0481                32,2235  22335 1
0482                32,2236  20000 0  V(21K)   2DEC   64.000 B-7
0482                32,2237  00000 1
0483                32,2240  00033 1  TLESS26  2DEC*  5.70146688 E7 B-35*    8660PHI/V
0483                32,2241  05763 0
0484                32,2242  00053 1  TGR26CON 2DEC   7.2 E5 B-28     PHI/3
0484                32,2243  36200 0
0485                32,2244  23637 1  V(26K)   2DEC   79.248 B-7      26000
0485                32,2245  27636 1
0486                32,2246  00012 1  X1CON     DEC   10
0487                32,2247  00010 0           DEC   8
0488                32,2250  00006 1           DEC   6
A0489                                                <<<< TABLE IS INDEXED. KEEP IN ORDER >>>
A0490                                                                ABOVE
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P0491   ..... AVFLAGA/P .....

R0492   SUBROUTINES USED

R0493           LFFLAG
R0494           DOWNFLAG
 0496   REF   2  LAST  624    35,2000                        SETLOC P30S1
 0497                         35,3726                        BANK
 0498   REF  17  LAST  547    E4,1770                        EBANK= SUBEXIT
 0499                         35,3726  0 0006 1  AVFLAGA     EXTEND          AVFLAG = CSM
 0500   REF  18  LAST  636    35,3727  23'770 0              QXCH   SUBEXIT
 0501   REF  39  LAST  626    35,3730  0 5447 0              TC     DOWNFLAG
 0502   REF   7  LAST  631    35,3731   00050 1              ADRES  AVFLAG   BIT 5  FLAG 2
 05025  REF   4  LAST  558    35,3732  3 4753 1              CAF    EBANK7
 05026  REF  29  LAST  563    35,3733  54 003 0              TS     EBANK
 05027  REF   2  LAST  170    E7,1424                        EBANK= ECSTEER
 0503   REF  20  LAST  627    35,3734  3 4676 1              CAF    BIT13
 0504   REF   3  LAST  636    35,3735  55'424 0              TS     ECSTEER  SET ECSTEER = 1
 05045  REF   1                35,3736  3 4700 1              CAF    EBANK4
 05046  REF  30  LAST  636    35,3737  54 003 0              TS     EBANK
 05047  REF  19  LAST  636    E4,1770                        EBANK= SUBEXIT
 0505   REF  20  LAST  636    35,3740  0 1770 0              TC     SUBEXIT
 0506                         35,3741  0 0006 1  AVFLAGP     EXTEND          AVFLAG = LEM
 0507   REF  21  LAST  636    35,3742  23'770 0              QXCH   SUBEXIT
 0508   REF  36  LAST  626    35,3743  0 5435 0              TC     UPFLAG
 0509   REF   8  LAST  636    35,3744   00050 1              ADRES  AVFLAG   BIT 5  FLAG 2
 05091  REF  22  LAST  636    35,3745  0 1770 0              TC     SUBEXIT
 0510                         35,3746  0 0006 1  P20FLGON    EXTEND
 0511   REF  23  LAST  636    35,3747  23'770 0              QXCH   SUBEXIT
 05111  REF  37  LAST  636    35,3750  0 5435 0              TC     UPFLAG
 05112  REF   6  LAST  626    35,3751   00031 0              ADRES  TRACKFLG
 05113  REF  38  LAST  636    35,3752  0 5435 0              TC     UPFLAG
 05114  REF  16  LAST  626    35,3753   00027 1              ADRES  UPDATFLG
 0512   REF  24  LAST  636    35,3754  0 1770 0              TC     SUBEXIT
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R1000 PROGRAM DESCRIPTION **P40CSM**

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1129  REF  14  LAST  272   E6,1466                          EBANK= DAPDATR1
1130                       31,3215                          BANK   31
1131  REF   1              24,2000                          SETLOC P40S
1132                       24,2002                          BANK

1133  REF   1                                               COUNT  24/P40

1134  REF  40  LAST  636   24,2002  0 5447 C  P40CSM       TC     DOWNFLAG
1135  REF   1              24,2003   00023 C                ADRES  ENG2FLAG

1136  REF 131  LAST  627   24,2004  0 6006 1                TC     INTPRET
1137                       24,2005   43135 1                SLOAD  BOFF
1138  REF   4  LAST  636   24,2006   03425 1                       ECSTEER        IS THIS AN EXTERNAL DELTA V BURN
1139  REF   5  LAST  626   24,2007   01347 0                       XDELVFLG
1140  REF   1              24,2010   50013 C                       P40S/C         NO   CSTEER = ECSTEER
1141                       24,2011   77745 1                DLOAD                 YES  CSTEER = ZERO
1142  REF  12  LAST  633   24,2012   15332 1                       HI6ZEROS
1143  REF   3  LAST  166   24,2013   17703 C  P40S/C        STODL  CSTEER
1144  REF   1              24,2014   10335 0                       FENG           SET UP THRUST FOR P40 20,000 LBS
1145  REF   2  LAST  121   24,2015   17727 C  P40S/F        STODL  F              P41 ENTERS HERE
1146  REF  31  LAST  631   24,2016   03413 1                       TIG            ORIGINAL TIG MAY BE SLIPPED BY P40S/SV
1147  REF   2  LAST  114   24,2017   03450 C                STORE  NOMTIG         SET ORIGINAL TIME OF IGNITION FOR S40.9

1148                       24,2020   77776 1                EXIT
1149  REF 159  LAST  626   24,2021  0 4555 C                TC     BANKCALL
1150  REF   4  LAST  606   24,2022   17573 0                CADR   R02BOTH        IMU STATUS CHECK

1151  REF 132  LAST  637   24,2023  0 6006 1  P40PVA        TC     INTPRET
1152                       24,2024   77624 1                CALL
1153  REF   1              24,2025   34000 C                       S40.1          COMPUTE VGTIG,UT
1154                       24,2026   77624 1                CALL
1155  REF   1              24,2027   51514 C                       S40.2,3        COMPUTE PREFERRED ATTITUDE
1156                       24,2030   77414 C                SET    EXIT
1157  REF   1              24,2031   01073 1                       PFRATFLG
1158  REF   2  LAST  198   24,2032  0 2212 1  P40SXTY       TCR    SETMINDB -1    NARROW DEADBAND FOR MANEUVER (EBANK6)
1159                       24,2033  0 0003 1                RELINT
1160  REF 160  LAST  637   24,2034  0 4555 C                TC     BANKCALL
1161  REF   5  LAST  611   24,2035   56000 1                CADR   R60CSM         ATTITUDE MANEUVER
1162  REF  75  LAST  624   24,2036  4 4712 C                CS     ONE            FOR UPDATEVG
1163  REF   2  LAST  104   24,2037  55*746 1                TS     NBRCYCLS
1164  REF  39  LAST  636   24,2040  0 5435 C                TC     UPFLAG
1165  REF   3  LAST  624   24,2041   00155 C                ADRES  TIMRFLAG       ALLOW CLOCKTASK

1166  REF   1              24,2042  0 2252 C                TC     P41/P40
1167  REF   1              24,2043  0 2267 C                TC     P41/DSP        P41

1168  REF   1              24,2044  3 2351 1  P40TTOG       CAF    V06N40         INITIALIZE FOR CLOCKTASK WHICH IS CALLED
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1169   REF   2  LAST  624   24,2045  55'145 1          TS      NVWORD1         BELOW

1170   REF 133  LAST  637   24,2046  0 6006 1          TC      INTPRET
1171                        24,2047   51575 1          VLOAD   ABVAL           FOR R2
1172   REF   5  LAST  168   24,2050   03721 C          VGTIG
1173   REF   6  LAST  631   24,2051   17654 C          STODL   VGDISP
11731  REF  13  LAST  637   24,2052   15332 1          HI6ZEROS
11732  REF   4  LAST  274   24,2053   03426 1          STORE   DVTOTAL
1174                        24,2054   77776 1          EXIT

1175                        24,2055   0 0006 1         EXTEND
1176   REF   1              24,2056   3 2775 C         DCA     STEERADS        SET FOR UPDATEVG AND TEST FOR STEERING
1177   REF   3  LAST   76   24,2057   53'223 1         DXCH    AVEGEXIT        AFTER AVERAGE G

1178   REF   1              24,2060   3 2344 C  P40GM8  CAF     P40CKLS2        (4.1 PROTECTION)
1179   REF 161  LAST  637   24,2061   0 4555 C         TC      BANKCALL
1180   REF   2  LAST  610   24,2062    20751 C         CADR    GOPERF1
1181   REF   1              24,2063   1 2204 1         TCF     POST41          V34
1182   REF   1              24,2064   1 2364 C         TCF     TST,TRIM        V33
1183   REF  39  LAST  573   24,2065   4 4712 C  TRIMONLY CS      BIT1            SET MRKRTEMP FOR GIMBAL TRIM  (-1)
1184   REF   1              24,2066   55'445 1    +1    TS      MRKRTMP         ENTRY FROM TST,TRIM

1185   REF 124  LAST  624   24,2067   3 4714 1         CAF     ZERO            SET CNTR  +0 FOR RESTART LOGIC IN S40.6
1186   REF   1              24,2070   55'447 C         TS      CNTR                  +0 SAYS NORMAL ENTRY.
A1187                                                                          +1 (PRE40.6) SAYS RESTART ENTRY

1188   REF  76  LAST  637   24,2071   3 4712 1         CAF     ONE
1189   REF  22  LAST  624   24,2072   0 5140 1         TC      WAITLIST
1190   REF  15  LAST  637   E6,1466                    EBANK=  DAPDATR1
1191   REF   1              24,2073    02050 C         2CADR   S40.6
1191   REF   1              24,2074    40066 C
1192   REF   2  LAST  638   24,2075   11'445 1         CCS     MRKRTMP         TEST TO FIND TIME TO WAIT FOR GIMBALTEST
1193   REF   1              24,2076   3 2343 1         CAF     18SEC            PLUS, DELAY FOR 18 SECONDS
1194                        24,2077   1 2101 1         TCF     +2              HOLE
1195   REF   1              24,2100   3 3000 1         CAF     5SEC            DELAY FOR TRIM ONLY TASK
1196   REF 162  LAST  638   24,2101   0 4555 C         TC      BANKCALL
1197   REF   8  LAST  574   24,2102    01730 1         CADR    DELAYJOB
1198   REF  12  LAST  624   24,2103   0 5261 1         TC      2PHSCHNG
1199                        24,2104    40026 1         OCT     40026           6.2 = PRE40.6(-OCS), CLOKTASK(100CS)
1200                        24,2105    00234 1         OCT     00234           4.23 = P40S/SV (PRIO12)
1201   REF  77  LAST  638   24,2106   3 4712 1  P40S/RS CAF     ONE
1202   REF  23  LAST  638   24,2107   0 5140 1         TC      WAITLIST        P41/SDP
1203   REF  32  LAST  637   E7,1412                    EBANK=  TIG
1204   REF   4  LAST  624   24,2110    03174 C         2CADR   CLOKTASK
1204                        24,2111    50067 C

1205                        24,2112   0 0003 1         RELINT

1206   REF   1              24,2113   0 3306 1  P40S/SV TCR     E7SETTER        JOB, 4.23 PRETECTS, PRIO12
1207   REF  33  LAST  638   E7,1412                    EBANK=  TIG
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1208   REF 134  LAST  638   24,2114  0 6006 1          TC      INTPRET
1209                        24,2115   45345 1          DLOAD   DSU
1210   REF  34  LAST  638   24,2116   03413 1                  TIG
1211   REF   1               24,2117   10342 0                  SEC29.96
1212   REF  34  LAST  630   24,2120   00041 1          STORE   TDEC1

1213                        24,2121   77624 1          CALRB                   RETURN IN BASIC
1214   REF   1               24,2122   27574 1                  MIDTCAV1
1215                        24,2123  1 2125 1          TCF     +2
1216   REF   1               24,2124  0 2146 0          TC      P40SNEWM       INTEGRATION TIME GREATER THAN ALLOWED
1217                        24,2125  0 0006 1 P40SET   EXTEND
1218   REF 266  LAST  621   24,2126  3 0155 0          DCA     MPAC           DELTA TIME TO PREREAD (INT.INIT.)
1219   REF   9  LAST  209   24,2127  53'673 0          DXCH    P40TMP
1223                        24,2130  0 0006 1          EXTEND
1224   REF   1               24,2131  4 3000 0          DCS     5SECDP         FOR TTGBLNK
1225   REF  10  LAST  639   24,2132  21'673 0          DAS     P40TMP
1226                        24,2133  0 0006 1          EXTEND
1227   REF  11  LAST  639   24,2134  3 1673 1          DCA     P40TMP
1228   REF   2  LAST  415   24,2135  0 5231 1          TC      LONGCALL
1229   REF  35  LAST  639   E7,1412                    EBANK=  TIG
1230   REF   3  LAST  208   24,2136   02366 0          2CADR   TIGBLNK
1230                        24,2137   50067 0
1231   REF  41  LAST  626   24,2140  0 5301 0          TC      PHASCHNG
1232                        24,2141   20214 1          OCT     20214          4.21 = TIGBLNK (P40TMP CS)

1233   REF  79  LAST  626   24,2142  1 5112 1          TCF     ENDOFJOB
1234   REF 163  LAST  638   24,2143  0 4555 0 P40ELNKR TC      BANKCALL
1235   REF   4  LAST  525   24,2144   20607 1          CADR    CLEANDSP       REMOVE RESIDUE
1236   REF  80  LAST  639   24,2145  1 5112 1          TCF     ENDOFJOB
12362  REF  36  LAST  639   E7,1412                    EBANK=  TIG
1237                        24,2146  0 0006 1 P40SNEWM EXTEND
1238   REF   5  LAST  299   24,2147  3 1246 0          DCA     PIPTIME1
1239   REF  37  LAST  639   24,2150  53'413 1          DXCH    TIG            SET NEW TIG FOR 06 40
1240                        24,2151  0 0006 1          EXTEND
1241   REF   2  LAST  639   24,2152  3 2342 0          DCA     SEC29.96
1242   REF  38  LAST  639   24,2153  21'413 1          DAS     TIG
1243   REF   1               24,2154  1 2125 1          TCF     P40SET         FOR LONGCALL OF TIG-30( OR -35)

1244   REF  16  LAST  638   E6,1466                    EBANK=  DAPDATR1
1245   REF   1               24,2155  3 2353 0 POSTBURN CAF     V16N40
1246   REF 164  LAST  639   24,2156  0 4555 0          TC      BANKCALL
1247   REF   1               24,2157   20610 1          CADR    REFLASH
1248   REF   2  LAST  638   24,2160  1 2204 1          TCF     POST41         V34 GO FINISH
1249   REF   1               24,2161  1 2163 0          TCF     P40RCS         PROCEED
1250   REF   2  LAST  208   24,2162  1 2155 0          TCF     POSTBURN       RECYCLE
1252                        24,2163  0 0006 1 P40RCS   EXTEND                 V99N40 ENTERS HERE ON A P40 BYPASS SPS
1253   REF   1               24,2164  3 2411 1          DCA     ACADN85
1254   REF   4  LAST  638   24,2165  53'223 1          DXCH    AVEGEXIT
1255   REF   2  LAST  528   24,2166  3 4735 1          CAF     2SECS          WAIT FOR CALCN85 VIA AVEGEXIT
1256   REF 165  LAST  639   24,2167  0 4555 0          TC      BANKCALL
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1257   REF   9  LAST  636   24,2170   01730 1          CADR    DELAYJOB

1258   REF   3  LAST  637   24,2171   0 2212 1 P40MINDB TCR     SETMINDB -1
1259                        24,2172   0 0003 1          RELINT
1260   REF  42  LAST  639   24,2173   0 5301 C TIGNCW   TC      PHASCHNG
12602                       24,2174    05024 1          OCT     05024          TYPE C GROUP 4 BELOW FOR NOUN 85
12604                       24,2175    20000 C          OCT     20000C         PRIO 20
12606  REF   1              24,2176   3 2350 C          CAF     V16N85B
1261   REF 166  LAST  639   24,2177   0 4555 C          TC      BANKCALL
1262   REF   2  LAST  639   24,2200    20610 1          CADR    REFLASH
1263   REF   3  LAST  639   24,2201   1 2204 1          TCF     POST41         FINISH P40/P41
1264   REF   4  LAST  640   24,2202   1 2204 1          TCF     POST41         V03 PROCEED WITH REST OF THE CLEAN-UP
1265   REF   1              24,2203   1 2173 1          TCF     TIGNCW         V32 NOT GSOP RESPONSE BUT REDISPLAY N85

1267                        24,2204   0 0006 1 POST41   EXTEND
1268   REF   1              24,2205   3 2407 C          DCA     SERVCADR
1269   REF   5  LAST  639   24,2206   53'223 1          DXCH    AVEGEXIT
1271   REF  39  LAST  626   24,2207   1 4106 C          TCF     GOTOPOOH


1272                        24,2210    00056 1 MINDB    DEC     46
1273                        24,2211    00707 1 MAXDB    DEC     455
12732  REF  17  LAST  639   E6,1466                     EBANK=  DAPDATR1
1274                        24,2212   0 0004 C    -1    INHINT
1275   REF  13  LAST  581   24,2213   3 0032 C SETMINDB CA      CDUX           ROUTINE FOR SETTING
1276   REF   4  LAST  167   24,2214   55'572 1          TS      THETADX        THE MINIMUM DEADBAND
1277                        24,2215   0 0006 1          EXTEND                 IN AUTOPILOT
1278   REF   5  LAST  561   24,2216   3 0034 C          DCA     CDUY
1279   REF   2  LAST  106   24,2217   53'574 1          DXCH    THETADY
1280   REF   1              24,2220   3 2210 C          CA      MINDB          SHOULD BE CALLED UNDER
1281   REF   2  LAST  107   24,2221   55'655 1          TS      ADB            INTERRUPT INHIBITED
1282   REF  26  LAST  581   24,2222   4 4707 1          CS      BIT4           EBANK = E6
1283   REF  18  LAST  64C   24,2223   7 1466 C          MASK    DAPDATR1
1284   REF  19  LAST  64C   24,2224   55'466 C          TS      DAPDATR1
1285   REF 155  LAST  626   24,2225   0 0002 C          TC      Q

12852  REF  2C  LAST  64C   E6,1466                     EBANK=  DAPDATR1
1286                        24,2226   0 0004 C    -1    INHINT
1287   REF   1              24,2227   3 2211 1 SETMAXDB CA      MAXDB          ROUTINE FOR SETTING
1288   REF   3  LAST  64C   24,2230   55'655 1          TS      ADB            THE MAXIMUM DEADBAND IN AUTOPILOT
1289   REF  21  LAST  64C   24,2231   4 1466 C          CS      DAPDATR1
1290   REF  27  LAST  64C   24,2232   7 4707 1          MASK    BIT4           SHOULD BE CALLED UNDER
1291   REF  22  LAST  64C   24,2233   27'466 C          ADS     DAPDATR1       INTERRUPT INHIBITED
1292   REF 156  LAST  64C   24,2234   0 0002 C          TC      Q              EBANK = E6
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P1293 PROGRAM DESCRIPTION **P41CSM**

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1354  REF  23  LAST  640   E6,1466                          EBANK=  DAPDATR1
1355  REF   1                                               COUNT   24/P41

1356  REF  40  LAST  637   24,2235   0 5435 0  P41CSM      TC      UPFLAG
1357  REF   2  LAST  637   24,2236    00023 0               ADRES   ENG2FLAG        SET FOR RCS

1358  REF 135  LAST  639   24,2237   0 6006 1              TC      INTPRET
1359                       24,2240    77745 1              DLOAD
1360  REF  14  LAST  638   24,2241    15332 1                      HI6ZERCS        FOR P41 CSTEER =0
1361  REF   4  LAST  637   24,2242    03703 0              STORE   CSTEER

1362                       24,2243    43145 0              DLOAD   BON
1363  REF   1              24,2244    10337 1                      FRCS2           2JET THRUST FOR S40.1
1364  REF   1              24,2245    00700 0                      NJETSFLG
1365  REF   1              24,2246    50015 0                      P40S/F          NJETS = 1 2-JET
1366                       24,2247    52015 1              DAD     GOTO            NJETS = 0  4-JET
1367  REF   2  LAST  641   24,2250    10337 1                      FRCS2
1368  REF   2  LAST  641   24,2251    50015 0                      P40S/F

1369  REF  11  LAST  509   24,2252   4 1011 1  P41/P40     CS      MODREG
1370  REF  78  LAST  638   24,2253   7 4712 0              MASK    ONE             P41EXITS AT CALL LOC +1
1371                       24,2254   0 0006 1              EXTEND
1372                       24,2255   1 2257 1              BZF     +2              P41
1373  REF 157  LAST  640   24,2256   24 002 0              INCR    Q               P40 EXITS AT CALL LOC +2
1374  REF 158  LAST  641   24,2257   0 0002 0              TC      Q

1375  REF   4  LAST  428   24,2260   3 4675 1  TTG/0       CAF     PRIO20          TASK (4.4 PROTECTS IN P41)
1376  REF  18  LAST  573   24,2261   0 5027 1              TC      NOVAC
1377  REF  24  LAST  641   E6,1466                          EBANK=  DAPDATR1
1378  REF   2  LAST  640   24,2262    02173 0              2CADR   TIGNCW
1378                       24,2263    50066 1

1379  REF  41  LAST  637   24,2264   0 5447 0  P40CLK      TC      DOWNFLAG
1380  REF   4  LAST  637   24,2265    00155 0              ADRES   TIMRFLAG

1382  REF  26  LAST  529   24,2266   1 5213 0              TCF     TASKOVER

1383  REF   1              24,2267   3 2347 0  P41/DSP     CAF     V06N85B         SET UP FOR NONFLASH V 06 N85 BY CLOCKJOB
1384  REF   3  LAST  638   24,2270   55'145 1              TS      NVWORD1

1385  REF 136  LAST  641   24,2271   0 6006 1              TC      INTPRET
1386                       24,2272    77624 1              CALL                    COMPUTE
1387  REF   1              24,2273    50314 1                      P40CNV85                VGTIG IN CTRL COORDS
1388                       24,2274    77776 1              EXIT
1389                       24,2275   0 0006 1              EXTEND                  DO CONTROL COORD CALCULATION AFTER AVEG
1390  REF   2  LAST  639   24,2276   3 2411 1              DCA     ACADN85
1391  REF   6  LAST  640   24,2277   53'223 1              DXCH    AVEGEXIT
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1392  REF  13  LAST  636   24,2300  0 5261 1          TC      2PHSCHNG
1393                       24,2301   40036 0          OCT     40036          6.3=CLOKTASK(100CS)
1394                       24,2302   00234 1          OCT     234            4.23=P40S/SV(PRIO12)

1395  REF   1              24,2303  1 2106 0          TCF     P40S/RS
1396  REF   2  LAST  640   24,2304  3 2350 0 P41REDSP CAF     V16N85B        ENTER FROM P41 SIDE OF TIGAVEG
1397  REF   4  LAST  641   24,2305  55'145 1          TS      NVWORD1         REDISPLAY NONFLASHING
1398  REF   3  LAST  639   24,2306  3 2342 0          CAF     SEC29.96 +1
1399  REF  24  LAST  638   24,2307  0 5140 1          TC      WAITLIST
1400  REF  25  LAST  641   E6,1466                    EBANK=  DAPDATR1
1401  REF   2  LAST  207   24,2310   02260 1          2CADR   TTG/0
1401                       24,2311   50066 1
1402  REF  22  LAST  619   24,2312  4 4710 1          CS      BIT3           4.4 = TTG/0(2996CS), PRECHECK(-0CS)
1403  REF   1              24,2313  1 2515 0          TCF     TTGPHS
1404                       24,2314   40220 0 P40CNV85  STQ     SETPD
1405  REF   1              24,2315   03730 0          QTEMP1
1406                       24,2316   00001 0          0
1407                       24,2317   41575 0          VLOAD   PUSH
1408  REF   1              24,2320   03721 0          VGPREV         EQUALS VGTIG (TARGETTING INPUT)
1409                       24,2321   77624 1          CALL
1410  REF   1              24,2322   45426 0          S41.1
1411  REF   6  LAST  275   24,2323   37665 0          STCALL  VGBODY
1412  REF   2  LAST  642   24,2324   03730 0          QTEMP1

14122 REF  26  LAST  642   E6,1466                    EBANK=  DAPDATR1
1413  REF 137  LAST  641   24,2325  0 6006 1 CALCN85  TC      INTPRET
1414                       24,2326   77624 1          CALL
1415  REF   1              24,2327   51020 1                  UPDATEVG       NEW VG, S40.8(+MAYBE S40.9)
1416                       24,2330   77624 1          CALL
1417  REF   2  LAST  641   24,2331   50314 1                  P40CNV85       COMPUTE VGBODY
1418                       24,2332   77776 1          EXIT
1419  REF   1              24,2333  0 3131 1          TC      SERVXT
1420                       24,2334   02217 1 FENG     2DEC    9.1188544 B-7  SPS THRUST (20500LBS), SC.AT B+7 NEWT/E4
1420                       24,2335   06650 1
1421                       24,2336   00013 0 FRCS2    2DEC    .087437837 B-7 RCS ULLAGE (199.6COS10 LBS), SC.AT
1421                       24,2337   06112 0
A1422                                                                        B+7 NEWTONS/E+4
1423                       24,2340   04700 1 SEC24.96 DEC     2496
1424                       24,2341   00000 1 SEC29.96 2DEC    2996
1424                       24,2342   05664 0
1425                       24,2343   03410 1 18SEC    DEC     1800
1426                       24,2344   00204 1 P40CKLS2 OCT     204
1427                       24,2345   37730 1 40CST5   OCT     37730          40 CS FOR THE T5 CLOCK
1428  REF   4  LAST  377     4377              OCT12    =       TEN
1429                       24,2346   04123 0 V1683    VN      1683
1430                       24,2347   01525 1 V06N85B  VN      0685
1431                       24,2350   04125 0 V16N85B  VN      1685
1432                       24,2351   01450 1 V06N40   VN      0640
1433                       24,2352   24020 0 P40CK99  OCT     24020          BITS 14,12, AND5 FOR LINUS VERB 99
1434                       24,2353   04050 0 V16N40   VN      1640
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1435                              24,2354   00027 1  OCT27/24 OCT     27
1436                              24,2355   00053 1  OCT53    OCT     53
1437                              24,2356   00035 1  OCT35    OCT     35
1438  REF  27  LAST  642          E6,1466                     EBANK=   DAPDATR1
1439  REF   4  LAST  254          24,2357   03132 1  T5IDL24  2CADR   T5IDLOC
1439                              24,2360   12066 1
14392                             24,2361   01120 0  MDOTHI   2DEC    .289391932 B-3  63.8 LB/SEC, SC.AT B+3 KG/CS   (=MDOTLO)
14392                             24,2362   25456 1
1440                              24,2363   00026 0  3MDOT    DEC     86.8175796 B-16 3SEC MASS LOSS (63.8 LBS/SEC), SC.AT
A1441                                                                                 B+16 KG/SEC
1445  REF  40  LAST  638          24,2364   3 4712 1 TST,TRIM CAF     BIT1            SET UP FOR GIMB DRIVE TEST AND TRIM (+1)
1446  REF   1                     24,2365   1 2066 1          TCF     TRIMONLY +1
1447  REF   2  LAST  638          24,2366   3 3000 1 TIGBLNK  CAF     5SEC            CALL TIGAVEG IN FIVE SEC AT TIG-30
1448  REF  25  LAST  642          24,2367   0 5140 1          TC      WAITLIST
1449  REF  39  LAST  639          E7,1412                     EBANK=   TIG
1450  REF   2  LAST  208          24,2370    02504 1          2CADR   TIGAVEG
1450                              24,2371    50067 0
1451  REF 125  LAST  638          24,2372   3 4714 1          CAF     ZERO            DISABLE HERE, NOT IN P40BLNKR
1452  REF   5  LAST  642          24,2373   55'145 1          TS      NVWORD1

1453  REF   4  LAST  559          24,2374   3 4761 0          CAF     PRIO14
1454  REF  19  LAST  641          24,2375   0 5027 1          TC      NOVAC
1455  REF  40  LAST  643          E7,1412                     EBANK=   TIG
1456  REF   1                     24,2376    02143 0          2CADR   P40BLNKR          DONT PROTECT-RESTARTS BLANK DSKY
1456  REF   1                     24,2377    50067 0
1457  REF   3  LAST  219          24,2400   4 4362 0          CS      OCT37           4.37 = TIGAVEG (500CS)
1458  REF   2  LAST  428          24,2401   0 4114 1 P40TSK   TC      NEWPHASE
1459                              24,2402    00004 0          OCT     4
1460  REF  27  LAST  641          24,2403   0 5213 1          TC      TASKOVER

1461  REF  41  LAST  643          E7,1412                     EBANK=   TIG
1462  REF   1                     24,2404    02440 0 ACADN83  2CADR   CALCN83
1462  REF   1                     24,2405    50067 0
1463  REF  42  LAST  643          E7,1412                     EBANK=   TIG
1464  REF   2  LAST  529          24,2406    03136 0 SERVCADR 2CADR   SERVEXIT
1464                              24,2407    76067 1
1465  REF  28  LAST  643          E6,1466                     EBANK=   DAPDATR1
1466  REF   1                     24,2410    02325 1 ACADN85  2CADR   CALCN85
1466  REF   1                     24,2411    50066 1
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P1467 PROGRAM DESCRIPTION **P47CSM**

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1508   REF   1                                          COUNT  24/P47

1509   REF   43  LAST  643   E7,1412                    EBANK= TIG
1510   REF  167  LAST  640   24,2412   0 4555 0  P47CSM  TC     BANKCALL      IMU STATUS CHECK
1511   REF    5  LAST  637   24,2413    17573 0         CADR   R02BOTH
1512   REF  138  LAST  642   24,2414   0 6006 1         TC     INTPRET
1513                         24,2415    77624 1         CALRB
1514   REF    1              24,2416    27570 0                MIDTCAV2
1515   REF  267  LAST  639   24,2417   30 155 0         CAE    MPAC +1       DELTA TIME TO RPEREAD (LESS THAN 1000
1516   REF   12  LAST  639   24,2420   55'672 1         TS     P40TMP              CS, WITH A TPAGREE, INT.INIT.)
1517   REF   26  LAST  643   24,2421   0 5140 1         TC     WAITLIST
1518   REF   44  LAST  644   E7,1412                    EBANK= TIG
1519   REF    2  LAST  209   24,2422    02427 1         2CADR  TIGON         TIGON IS REQUIRED TO MATHCHTAT AND AVEG
1519                         24,2423    50067 0

1520   REF   43  LAST  640   24,2424   0 5301 0         TC     PHASCHNG
1521                         24,2425    40574 0         OCT    40574         A, 4.57 = TIGON (P40TMP CS)
1522   REF   81  LAST  639   24,2426   1 5112 1         TCF    ENDOFJOB

15222  REF   13  LAST  644   E7,1672                    EBANK= P40TMP
1523                         24,2427   0 0006 1  TIGON  EXTEND
1524   REF    1              24,2430   3 2405 1         DCA    ACADR83
1525   REF    7  LAST  641   24,2431   53'223 1         DXCH   AVEGEXIT
1526   REF   10  LAST  581   24,2432   3 4371 0         CAF    PRIO30        FORCE ZERCING OF N83 BEFORE SERVICER
1527   REF   20  LAST  643   24,2433   0 5027 1         TC     NOVAC
1528   REF   45  LAST  644   E7,1412                    EBANK= TIG
1529   REF    2  LAST  207   24,2434    02463 1         2CADR  P47BODY
1529                         24,2435    50067 0
1530   REF   26  LAST  576   24,2436   4 4711 0         CS     BIT2          4.2 = PRECHECK (-OCS), P47BODY (PRIO30)
1531   REF    2  LAST  642   24,2437   1 2515 0         TCF    TTGPHS

1532   REF   46  LAST  644   E7,1412                    EBANK= TIG
1533   REF  139  LAST  644   24,2440   0 6006 1  CALCN83 TC     INTPRET
15333                        24,2441    77601 0         SETPD                SET UP PUSHLIST FOR S41.1
15336                        24,2442    00001 0                0
1534                         24,2443    53375 0         VLOAD  VAD
1535   REF    1              24,2444    03665 1                DELVCTL
1536   REF    1              24,2445    03433 0                DELVREF
1537   REF    1              24,2446    03460 0         STORE  DV47TEMP      FOR COPYCYCLE BELOW
1538                         24,2447    45006 0         PUSH   CALL
1539   REF    2  LAST  642   24,2450    45426 0                S41.1
1540   REF    6  LAST  275   24,2451    37675 1         STCALL DELVIMU
1541   REF    2  LAST  529   24,2452    70436 1                S11.1         CALC. VI, H, HDOT FOR NOUN 62
1542                         24,2453    77776 1         EXIT
1543   REF   44  LAST  644   24,2454   0 5301 0         TC     PHASCHNG
1544                         24,2455    10035 0         OCT    10035
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1545   REF  13  LAST  559   24,2456  3 4715 C          CAF     FIVE
1546   REF  10  LAST  567   24,2457  0 5475 1          TC      GENTRAN
1547   REF   2  LAST  644   24,2460   01457 C          ADRES   DV47TEMP
1548   REF   2  LAST  644   24,2461   01664 1          ADRES   DELVCTL

1549   REF   2  LAST  642   24,2462  0 3131 1          TC      SERVXT
1550   REF 140  LAST  644   24,2463  0 6006 1 P47BODY  TC      INTPRET
1551                        24,2464   77775 1          VLOAD
1552   REF  15  LAST  641   24,2465   15332 1          HI6ZEROS
1553   REF   7  LAST  644   24,2466   03675 C          STORE   DELVINU      CLEAR DISPLAY AND ACCUMULATOR STORAGE
1554   REF   3  LAST  645   24,2467   03665 1          STORE   DELVCTL      UPON INITIATION OR-ENTER-RESPONSE
1555                        24,2470   77776 1          EXIT
1556   REF   3  LAST  378   24,2471  3 4762 C P47BOD   CAF     PRIO15       LOWER PRIO THAN CALCN83 (20)
15563  REF  10  LAST  574   24,2472  0 5103 C          TC      PRIOCHNG       TO PREVENT INTERRUPTION OF CALCN83
155635 REF  45  LAST  644   24,2473  0 5301 C          TC      PHASCHNG
15564                       24,2474   05024 1          OCT     05024        TYPE C GROUP 4 BELOW FOR NOUN 83
15565                       24,2475   15000 C          OCT     15000        PRIO 15
15566  REF   1              24,2476  3 2346 1 P47/DSP  CAF     V1683
1557   REF 168  LAST  644   24,2477  0 4555 C          TC      BANKCALL
1558   REF  27  LAST  626   24,2500   20624 C          CADR    GOFLASH
1559   REF  40  LAST  640   24,2501  0 4106 1          TC      GOTOPOOH
1560   REF  41  LAST  645   24,2502  0 4106 1          TC      GOTOPOOH
1561   REF   3  LAST  644   24,2503  1 2463 C          TCF     P47BODY      RECYCLE - CLEAR ACCUMULATED VELOCITY
```

P1563 RCLTINE **TIG-30** DESCRIPTION

```
1588   REF  47 LAST  644   E7,1412                          EBANK= TIG
1589   REF   2 LAST  637 TO  641:   155   155*              COUNT  24/P40

1590   REF   2 LAST  637   24,2504  0 2252 C  TIGAVEG  TC     P41/P40     TASK (4.37 PROTECTS)
1591   REF   1              24,2505  1 2304 C           TCF    P41REDSP    P41

1592   REF   2 LAST  637   24,2506  3 2351 1           CAF    V06N4C      UNBLANK DISPLAY
1593   REF   6 LAST  643   24,2507  55'145 1           TS     NVWORD1

1594   REF   1              24,2510  3 2340 1           CAF    SEC24.96
1595   REF  27 LAST  644   24,2511  0 5140 1           TC     WAITLIST
1596   REF  48 LAST  646   E7,1412                     EBANK= TIG
1597   REF   3 LAST  209   24,2512   02523 1           2CADR  TIG-5
1597                       24,2513   50067 C
1598   REF  23 LAST  567   24,2514  4 6211 1           CS     SIX         4.6 = TIG-5 (2496CS), PRECHECK (-0CS)
1599   REF   3 LAST  643   24,2515  0 4114 1  TTGPHS    TC     NEWPHASE    ENTRY FROM P41REDSP (P41) WITH A=-4, OR
1600                       24,2516   00004 C           OCT    4                     FROM TIGON    (P47) WITH A=-2

1601   REF   2 LAST  528   24,2517  10 763 1  PRECHECK  CCS    PHASE5      HAS SERVICER BEEN RESTARTED
1602   REF  28 LAST  643   24,2520  1 5213 C           TCF    TASKOVER    YES, DONT START ANOTHER ONE
1603   REF  40 LAST  622   24,2521  0 4574 C           TC     POSTJUMP
1604   REF   2 LAST  211   24,2522   76604 1           CADR   PREREAD
```

P1605 ROUTINE **TIG-5** DESCRIPTION

```
16242  REF  49  LAST  646   E7,1412                          EBANK=  TIG
1625   REF   3  LAST  643   24,2523   3 3000 1  TIG-5       CAF     5SEC
1626   REF  28  LAST  646   24,2524   0 5140 1              TC      WAITLIST
1627   REF  29  LAST  643   E6,1466                          EBANK=  DAPDATR1
1628   REF   3  LAST  210   24,2525    02541 C              2CADR   TIG-C
1628                        24,2526    50066 1
1629   REF  20  LAST  560   24,2527   4 4702 1              CS      BIT9          WILL CAUSE V99 FLASH
1630   REF   7  LAST  646   24,2530   55'145 1              TS      NVWORD1

1631   REF  14  LAST  642   24,2531   0 5261 1              TC      2PHSCHNG
1632                        24,2532    40074 C              OCT     40074         A, 4.7 = TIG-0 (500CS)
1633                        24,2533    00033 1              OCT     00033         A, 3.3 = S40.13 (PRIO20)

1634   REF   5  LAST  641   24,2534   3 4675 1              CAF     PRIO20
1635   REF  22  LAST  551   24,2535   0 5042 1              TC      FINDVAC
1636   REF   6  LAST  206   E7,1427                          EBANK=  TGO
1637   REF   2  LAST  206   24,2536    02404 C              2CADR   S40.13
1637                        24,2537    34067 1
1638   REF  29  LAST  646   24,2540   1 5213 C              TCF     TASKOVER
```

P1639 ROUTINES **TIG-0** AND **IGNITION** DESCRIPTION

```
1648   REF  30  LAST  647   E6,1466                          EBANK=  DAPDATR1      TASK, 4.7 PHASE, OR 4.77 (-OCS) IN R40
16485  REF   2  LAST  194   24,2541   4 0103 1  TIG-0       CS      FLAGWRD7      SET IGN FLAG
16486  REF  21  LAST  636   24,2542   7 4676 0               MASK    BIT13
16487  REF   3  LAST  648   24,2543   26 103 1               ADS     FLAGWRD7

1649   REF   4  LAST  648   24,2544   30 103 0               CAE     FLAGWRD7      CHECK ASTN FLAG FOR V99 RESPONSE
1650   REF  23  LAST  496   24,2545   7 4677 1               MASK    BIT12
1651                        24,2546   0 0006 1               EXTEND
1652   REF  30  LAST  647   24,2547   1 5213 0               BZF     TASKOVER      WAIT FOR V99P

16522  REF   3  LAST  646   24,2550   3 2351 1               CAF     V06N40        CLEAR THE V99 (IN CASE OF A RESTART
16524  REF   8  LAST  647   24,2551   55'145 1               TS      NVWORD1             DURING THE V99 SEQUENCE)

1653   REF  46  LAST  645   24,2552   0 5301 0               TC      PHASCHNG      V99P HAS COME ALREADY, DO IGNITION NOW
1654                        24,2553    00614 1               OCT     00614         A, 4.61 = IGNITION (-OCS) TBASE OLD

1660   REF  14  LAST  640   24,2554   30 032 0  IGNITION     CAE     CDUX          SAVE FOR ROLL DAP REFERENCE OGAD
1661   REF   1               24,2555   55'450 0               TS      OGAD                V99PJOB (CLOCKJOB) SETS UP IGNITION
1662                        24,2556   0 0006 1               EXTEND                      TASK (4.61 PROTECTION)
1663   REF  19  LAST  575   24,2557   3 0025 0               DCA     TIME2               FOR RESTARTS
1664   REF   4  LAST  168   24,2560   53'337 0               DXCH    TEVENT

1665   REF  10  LAST  581   24,2561   4 0101 0               CS      FLAGWRD5      SET ENGONFLG
1666   REF  33  LAST  576   24,2562   7 4704 1               MASK    BIT7
1667   REF  11  LAST  648   24,2563   26 101 0               ADS     FLAGWRD5
1668   REF  22  LAST  648   24,2564   3 4676 1  SPSON        CAF     BIT13         TURN ON SPS ENGINE
1669                        24,2565   0 0006 1               EXTEND
1670   REF  22  LAST  582   24,2566   05 011 1               WOR     DSALMOUT

1671   REF  21  LAST  647   24,2567   3 4702 0  IMPULCHK     CAF     BIT9          CHECK FOR IMPULSIVE BURN
1672   REF   8  LAST  472   24,2570   7 0076 1               MASK    FLAGWRD2
1673   REF 146  LAST  582   24,2571   10 000 0               CCS     A
1674   REF   1               24,2572   1 2657 0               TCF     IMPLBURN      IMPULSIVE
1675   REF  12  LAST  536   24,2573   4 0102 0               CS      FLAGWRD6      NON-IMPULSIVE, SET STRULLSW FOR STEERULL
1676   REF  23  LAST  648   24,2574   7 4676 0               MASK    BIT13
1677   REF  13  LAST  648   24,2575   26 102 0               ADS     FLAGWRD6

1678   REF   8  LAST  530   24,2576   4 4105 0  PREPTVC      CS      OCT60000      RESET T5 BITS
1679   REF  14  LAST  648   24,2577   7 0102 0               MASK    FLAGWRD6
1680   REF  15  LAST  648   24,2600   54 102 0               TS      FLAGWRD6

1681                        24,2601   0 0006 1               EXTEND                KILL RCS
1682   REF   1               24,2602   3 2360 0               DCA     T5IDL24
1683   REF   8  LAST  537   24,2603   53'313 0               DXCH    T5LOC

1684   REF  20  LAST  606   24,2604   4 6214 1               CS      THREE         4.3 = DOTVCON (40CS)
1685   REF   4  LAST  646   24,2605   0 4114 1               TC      NEWPHASE
1686                        24,2606    00004 0               OCT     4
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1687  REF   1                 24,2607  0 5156 C          TC     FIXDELAY
1688                          24,2610   00050 1          DEC    40          0.4 SECOND DELAY FOR THRUST BUILDUP

1689  REF  41 LAST  643       24,2611  4 4712 C DOTVCON  CS     BIT1        SET TVCPHASE = TVCDAPON CALL (FRESHDAP)
1690  REF   2 LAST  102       24,2612  55'654 C          TS     TVCPHASE
1691  REF 126 LAST  643       24,2613  3 4714 1          CAF    ZERO        SET TVCEXECUTIVE PHASE
1692  REF   2 LAST  102       24,2614  55'661 C          TS     TVCEXPHS
1693  REF   9 LAST  648       24,2615  4 4105 C          CS     OCT60000    SET T5 BITS TO INDICATE TVC TAKEOVER....
1694  REF  16 LAST  648       24,2616  7 0102 C          MASK   FLAGWRD6          BITS 15,14 = 10
1695  REF  31 LAST  409       24,2617  6 4674 C          AD     BIT15
1696  REF  17 LAST  649       24,2620  54 102 C          TS     FLAGWRD6

1697  REF  21 LAST  648       24,2621  3 6214 C          CAF    THREE       6.3 = CLOKTASK (100CS), DROPPING PRE40.6
1698  REF  65 LAST  614       24,2622  54 001 1          TS     L                WHICH IS HANDLED NOW BY REDOTVC
1699                          24,2623  4 0000 C          COM
1700  REF   2 LAST  180       24,2624  52 765 1          DXCH   -PHASE6

1701  REF  14 LAST  645       24,2625  4 4715 1          CS     FIVE        4.5 = DOSTRULL  (160 CS)
1702  REF   5 LAST  648       24,2626  0 4114 1          TC     NEWPHASE
1703                          24,2627   00004 C          OCT    4

1704  REF  14 LAST  575       24,2630  3 4672 C          CAF    POSMAX      SET TIME5 FOR STARTING RIGHT AWAY
1705  REF   6 LAST  537       24,2631  54 030 C          TS     TIME5
1706                          24,2632  0 0006 1          EXTEND
1707  REF   1                 24,2633  3 3003 1          DCA    TVCDN2C     (TVCDAPON)
1708  REF   9 LAST  648       24,2634  53'313 C          DXCH   T5LOC       (KILLS RCS DAP)

1709  REF   2 LAST  649       24,2635  0 5156 C          TC     FIXDELAY    0.4 + 1.6 = 2.0 SEC FOR ULLAGE-OFF AND
1710                          24,2636   00240 1          DEC    160              STEERING (IF NON-IMPULSIVE)

1711  REF  24 LAST  648       24,2637  3 4676 1 DOSTRULL CAF    BIT13       CHECK STRULLSW FOR IMPULSIVE BURN
1712  REF  18 LAST  649       24,2640  7 0102 C          MASK   FLAGWRD6
1713  REF 147 LAST  648       24,2641  10 000 C          CCS    A
1714  REF   1                 24,2642  0 2650 C          TCR    STEERULL    NON-IMPULSIVE, STEERING AND ULLAGE OFF
1715  REF   1                 24,2643  0 2653 C          TCR    ULAGEOFF    ULLAGE OFF  (ONLY, OR AGAIN)

1716                          24,2644  0 0006 1          EXTEND
1717  REF  12 LAST  196       24,2645  3 4714 1          DCA    NEGO        KILL GROUP 4  (DP NEGO = -0,+0)
1718  REF   3 LAST  196       24,2646  52 761 C          DXCH   -PHASE4

1719  REF  31 LAST  648       24,2647  1 5213 C ENDIGN   TCF    TASKOVER

1720  REF   9 LAST  648       24,2650  4 0076 1 STEERULL CS     FLAGWRD2    SET STEERSW
1721  REF  18 LAST  413       24,2651  7 4700 C          MASK   BIT11
1722  REF  10 LAST  649       24,2652  26 076 1          ADS    FLAGWRD2

1723  REF 127 LAST  649       24,2653  3 4714 1 ULAGEOFF CAF    ZERO
1724                          24,2654  0 0006 1          EXTEND
1725  REF   2 LAST  178       24,2655  01 005 C          WRITE  CHAN5       ZERO CHANNEL 5
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1726   REF 159  LAST  641   24,2656  0 0002 C            TC      Q


1727   REF  25  LAST  649   24,2657  4 4676 C  IMPLBURN CS      BIT13          RESET STRULLSW (COULD BE AN IMPULSIVE
17271  REF  19  LAST  649   24,2660  7 0102 C            MASK    FLAGWRD6            ENGINE FAIL)
17272  REF  20  LAST  650   24,2661  54 102 C            TS      FLAGWRD6

17273  REF   2  LAST  638   24,2662  0 3306 1            TCR     E7SETTER

1728   REF  50  LAST  647   E7,1412                     EBANK=  TIG
1729                        24,2663  0 0006 1            EXTEND                 PREPARE FOR R1 OF V06N40 (CLOCKTASK)
1730   REF   7  LAST  647   24,2664  3 1430 1            DCA     TGO
1731   REF  51  LAST  650   24,2665  53'413 1            DXCH    TIG
1732                        24,2666  0 0006 1            EXTEND
1733   REF  20  LAST  648   24,2667  3 0025 C            DCA     TIME2
1734   REF  52  LAST  650   24,2670  21'413 1            DAS     TIG

1735   REF   8  LAST  650   24,2671  31'430 1            CAE     TGO +1         (TPAGREE IN S40.13, LESS THAN 600CS)
1736   REF  29  LAST  647   24,2672  0 5140 1            TC      WAITLIST
1737   REF   9  LAST  650   E7,1427                     EBANK=  TGO
1738   REF   2  LAST  206   24,2673   02710 C           2CADR   ENGINOFF
1738                        24,2674   50067 C
1739   REF  15  LAST  647   24,2675  0 5261 1            TC      2PHSCHNG       PROTECT....
1740                        24,2676   40153 1            OCT     40153          A, 3.15 = ENGINOFF (TGO+1)....NOTE GROUP
1741                        24,2677   05014 1            OCT     05014          C, DELTAT NEXT, TASK BELOW, IN
17412                       24,2700   77777 C            DEC     -0             -0 CS

1742   REF  22  LAST  648   24,2701  4 4702 1            CS      BIT9           RESET IMPULSW, ENGINOFF IS NOW SET UP
1743   REF  11  LAST  649   24,2702  7 0076 1            MASK    FLAGWRD2
1744   REF  12  LAST  650   24,2703  54 076 1            TS      FLAGWRD2

1745   REF   1              24,2704  0 3311 1            TCR     E6SETTER
1746   REF  31  LAST  648   E6,1466                     EBANK=  DAPDATR1

17462  REF 128  LAST  649   24,2705  3 4714 1            CAF     ZERO           SET UP V97VCNTR IN CASE ENGINOFF (MASS-
17463  REF   2  LAST  209   24,2706  55'444 C            TS      V97VCNTR            BACK) ARRIVES BEFORE TVCDAPON

1747   REF   1              24,2707  1 2576 C            TCF     PREPTVC


1753   REF  10  LAST  650   E7,1427                     EBANK=  TGO            E7 FORCED BY 3.15SPOT VARIABLE DELTA-T
17532  REF   2  LAST  650   24,2710  0 3311 1  ENGINOFF TCR     E6SETTER       TASK, 3.15 PHASE (TGO+1 CS)       GET E6
17533  REF  32  LAST  650   E6,1466                     EBANK=  DAPDATR1
1754   REF   4  LAST  272   24,2711  31'474 1            CAE     CSMMASS
1755   REF   3  LAST  193   24,2712  55'662 C            TS      MASSTMP        COPYCYCLE FOR MASSBACK
1756   REF  16  LAST  650   24,2713  0 5261 1            TC      2PHSCHNG
1757                        24,2714   00003 1            OCT     00003          KILL GROUP 3 PROTECTION OF ENGINOFF, DO
1758                        24,2715   40634 1            OCT     40634          A, 4.63 = DOSPSOFF  (-0CS)
1759   REF   2  LAST  193   24,2716  0 2741 1  DOSPSOFF TCR     SPSOFF         SHUT DOWN SPS, MASS UPDATES, ETC.
1760   REF   1              24,2717  4 2354 C            CS      OCT27/24       (OCTAL 27)
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1761  REF   6 LAST  649  24,2720  0 4114 1          TC     NEWPHASE
1762                     24,2721   00004 0          OCT    4              4.27 = DOTVCRCS (250 CS)

1763  REF   3 LAST  649  24,2722  0 5156 0          TC     FIXDELAY       2.5 SECOND DELAY FOR SPS TAILOFF
1764                     24,2723   00372 1          DEC    250

1765  REF   2 LAST  198  24,2724  0 2227 1 DOTVCRCS TCR    SETMAXDB       WIDE DEADBAND FOR CUTOFF TRANSIENT

1766  REF  26 LAST  538  24,2725  0 4633 0          TC     IBNKCALL       SET UP RCS DAP (KILLS TVCDAPS, SETS T5
1767  REF   2 LAST  193  24,2726   42010 0          CADR   RCSDAPON             BITS, WAITS 0.6SEC FOR TVCEXEC DIE)

17672 REF  27 LAST  651  24,2727  0 4633 0          TC     IBNKCALL       UPDATE WEIGHT/G AND MASS-PROPERTIES FOR
17673 REF   3 LAST  247  24,2730   13176 0          CADR   MASSPROP             RCS DAP STARTUP IN 0.6 SECONDS

1768  REF   2 LAST  193  24,2731  0 3005 1          TCR    TVCZAP         WIPE OUT TVC, TURN OFF CLOCKTASK

1769  REF  47 LAST  648  24,2732  0 5301 0          TC     PHASCHNG
1770                     24,2733   00354 0          OCT    00354          A, 4.35 = POSTBURN (NOVAC, PRIO12)
1771  REF   2 LAST  178  24,2734  3 4603 0          CAF    PRIO12         SET UP POSTBURN V16N40 JOB
1772  REF  21 LAST  644  24,2735  0 5027 1          TC     NOVAC
1773  REF  33 LAST  650  E6,1466                    EBANK= DAPDATR1       (SETMAXDB IN POST41)
1774  REF   3 LAST  639  24,2736   02155 1          2CADR  POSTBURN
1774                     24,2737   50066 1
1775  REF  32 LAST  649  24,2740  1 5213 0          TCF    TASKOVER

1776  REF  34 LAST  651  E6,1466                    EBANK= DAPDATR1
1783                     24,2741  0 0006 1 SPSOFF   EXTEND                ESTABLISH SPSOFF TEVENT
1784  REF  21 LAST  650  24,2742  3 0025 0          DCA    TIME2
1785  REF   9 LAST  648  24,2743  53'337 0          DXCH   TEVENT
1786  REF  34 LAST  648  24,2744  4 4704 1          CS     BIT7           RESET ENGONFLG
1787  REF  12 LAST  648  24,2745  7 0101 0          MASK   FLAGWRD5
1788  REF  13 LAST  651  24,2746  54 101 0          TS     FLAGWRD5       (RESTARTS WILL SHUT DOWN SPS NOW)
1789  REF  26 LAST  650  24,2747  4 4676 0          CS     BIT13          SHUT DOWN SPS ENGINE
1790                     24,2750  0 0006 1          EXTEND
1791  REF  23 LAST  648  24,2751  03 011 1          WAND   DSALMOUT

1792  REF   3 LAST  650  24,2752  31'444 1 MASSBACK CAE    V97VCNTR       RESTORE PART OF PRE-DECREMENTED MASS
A1793                                                                        V97VCNTR = VCNTR UNLESS V97 IS
A1794                                                                        ACTIVE. ONLY V97VCNTR IS THEN RIGHT
1795                     24,2753  0 0006 1          EXTEND                  VCNTR COUNTS 1/2-SECONDS IN TVC EXEC
1796  REF   1           24,2754  7 2361 0          MP     MDOTHI             MDOT, SC<AT B+3 KG/CS
1797  REF 148 LAST  649  24,2755  22 000 1          LXCH   A
1798                     24,2756  0 0006 1          EXTEND
1799  REF   9 LAST  509  24,2757  7 4734 1          MP     1SEC           DEC 100
1800  REF   4 LAST  650  24,2760  6 1662 1          AD     MASSTMP        CORRECTION IS ACCURATE TO 5 CS OF FLOW
1801  REF   5 LAST  650  24,2761  55'474 0          TS     CSMMASS             (1.44 KG OR 0.4 BITS)

1806  REF  32 LAST  649  24,2762  3 4674 0 BESTTRIM CAF    BIT15          CHECK FOR SWITCHOVER, SELECT BEST TRIMS
1807  REF   9 LAST  572  24,2763  7 0105 1          MASK   FLAGWRD9            FOR NEXT IGNITION (OR REIGNITION)
1808                     24,2764  0 0006 1          EXTEND
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1809   REF   1                  24,2765  1 2767 1           BZF     DBARTRIM        PRE-SWITCHOVER
1810   REF 160  LAST  650       24,2766  0 0002 0           TC      Q               POST-SWITCHOVER, SO LEAVE TRIMS AS ARE

18105  REF   2  LAST  101       24,2767  31'621 0  DBARTRIM CAE     DELPBAR         UPDATE TRIMS WITH DELP,YBAR
1811   REF  12  LAST  273       24,2770  55'425 1           TS      PACTOFF
1812   REF   2  LAST  101       24,2771  31'623 1           CAE     DELYBAR
1813   REF   2  LAST  273       24,2772  55'426 1           TS      YACTOFF
1814   REF 161  LAST  652       24,2773  0 0002 0           TC      Q

1815   REF  35  LAST  651       E6,1466                     EBANK=  DAPDATR1
1816   REF   1                  24,2774   03121 0  STEERADS 2CADR   STEERING
1816   REF   1                  24,2775   50066 1
1817                            24,2776   37703 1  .6SEC15  OCT     37703
1818                            24,2777   00000 1  5SECDP   DEC     0               MAKE DP 5SEC
1819                            24,3000   00764 1  5SEC     DEC     500
18195                           24,3001   02202 0  OCT02202 OCT     02202           BITS 2,8,11 FOR CHANNEL 12 TVC/OPTICS
1820   REF  36  LAST  652       E6,1466                     EBANK=  DAPDATR1
1821   REF   1                  24,3002   02032 1  TVCCN2C  2CADR   TVCDAPON
1821   REF   1                  24,3003   36066 1

1822                            24,3004  0 0004 0    -1      INHINT
1823   REF   1                  24,3005  4 3001 1  TVCZAP   CS      OCT02202        DISABLE TVC AND OPT ERR CNTRS, REENGAGE
1824                            24,3006  0 0006 1           EXTEND                      OPTICS DAC
1825   REF  26  LAST  537       24,3007  03 012 1           WAND    CHAN12
1826   REF  42  LAST  649       24,3010  4 4712 0           CS      BIT1            ENABLE T4RUPT OPTICS MONITOR....PERMIT
1827   REF  23  LAST  444       24,3011  55'303 1           TS      OPTIND              OPTICS-ZERO BUT NOT OPTICS-DRIVE
18271  REF 129  LAST  650       24,3012  3 4714 1           CAF     ZERO            CLEAR NVWORD1 IN CASE CLOCKJOB WAITING
18272  REF   9  LAST  648       24,3013  55'145 1           TS      NVWORD1
1828   REF  19  LAST  649       24,3014  4 4700 0           CS      BIT11           CLEAR TIMRFLAG TO STOP CLOCKTASK
1829   REF   5  LAST  648       24,3015  7 0103 1           MASK    FLAGWRD7
1830   REF   6  LAST  652       24,3016  54 103 1           TS      FLAGWRD7
1831   REF 162  LAST  652       24,3017  0 0002 0           TC      Q
1832   REF  37  LAST  652       E6,1466                     EBANK=  DAPDATR1
1833                            24,3020   43020 1  UPDATEVG STQ     BON
1834   REF   3  LAST  642       24,3021   03730 0                    QTEMP1
1835   REF   6  LAST  637       24,3022   01307 1                    XDELVFLG
1836   REF   1                  24,3023   51047 0                    CALL40.8

1837                            24,3024   50135 0           SLOAD   BMN
1838   REF   3  LAST  637       24,3025   03347 1                    NBRCYCLS
1839   REF   1                  24,3026   51053 0                    SETUP.9

1840                            24,3027   53375 0           VLOAD   VAD
1841   REF   2  LAST  104       24,3030   03351 0                    DELVSUM
1842   REF   2  LAST  644       24,3031   03433 0                    DELVREF
1843   REF   1                  24,3032   03357 0           STORE   DELVSUMP
1844                            24,3033   77776 1           EXIT
1845   REF  79  LAST  641       24,3034   3 4712 1          CA      ONE
1846   REF   4  LAST  652       24,3035   6 1746 0          AD      NBRCYCLS
1847   REF   2  LAST  104       24,3036   55'747 0          TS      NBRCYCLP
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1848  REF  48  LAST  651   24,3037  0 5301 0          TC      PHASCHNG      TYPE 8 RESTART BELOW AND 5.3 REREADACCS
1849                       24,3040   10035 0          OCT     10035

1850  REF   3  LAST  652   24,3041  3 1747 1          CA      NBRCYCLP
1851  REF   5  LAST  652   24,3042  55*746 1          TS      NBRCYCLS
1852  REF 141  LAST  645   24,3043  0 6006 1          TC      INTPRET
1853                       24,3044   77775 1          VLOAD
1854  REF   2  LAST  652   24,3045   03357 0                  DELVSUMP
1855  REF   3  LAST  652   24,3046   03351 0          STORE   DELVSUM

1856                       24,3047   77624 1  CALL40.8 CALL
1857  REF   1              24,3050   34130 1                  S40.8
1858                       24,3051   77650 1          GOTO
1859  REF   4  LAST  652   24,3052   03730 0                  QTEMP1

1860                       24,3053   67214 1  SETUP.9  BON    SLOAD
1861  REF   1              24,3054   01310 1                  FIRSTFLG
1862  REF   1              24,3055   51070 1                  SURELY.9
1863  REF   4  LAST  653   24,3056   03350 1                  NBRCYCLP
1864                       24,3057   74301 0          NORM    VXSC          (NORM  HANDLES ZERO PROPERLY)
1865  REF  28  LAST  633   24,3060   00047 1                  X1
1866  REF   2  LAST  121   24,3061   03705 0                  BDT
1867                       24,3062   53257 1          VSR*    VAD
1868                       24,3063   20563 0                  0 -14D,1
1869  REF   1              24,3064   03646 0                  VGTEMP
1870                       24,3065   77651 0          VSU
1871  REF   4  LAST  653   24,3066   03351 0                  DELVSUM
1872  REF   2  LAST  642   24,3067   03721 0          STORE   VGPREV
1873                       24,3070   77776 1  SURELY.9 EXIT
1874  REF   6  LAST  258   24,3071  3 4676 1          CAF     PRIO10
1875  REF  23  LAST  647   24,3072  0 5042 1          TC      FINDVAC
1876  REF  38  LAST  652   E6,1466                    EBANK=  DAPDATR1
1877  REF   1              24,3073   02257 0          2CADR   S40.9
1877  REF   1              24,3074   34066 0
1878  REF  17  LAST  650   24,3075  0 5261 1          TC      2PHSCHNG
1879                       24,3076   00051 0          OCT     00051         A, 1.5 = REDO40.9, PRIO 10
1880                       24,3077   10035 0          OCT     10035
1881  REF 142  LAST  653   24,3100  0 6006 1          TC      INTPRET
1882                       24,3101   77775 1          VLOAD
1883  REF   9  LAST  534   24,3102   01171 1                  RN            ACTIVE VEHICLE RADIUS VECTOR AT T1
1884  REF  11  LAST  543   24,3103   27570 0          STOVL   RINIT
1885  REF   9  LAST  534   24,3104   01177 1                  VN            ACTIVE VEHICLE VELOCITY VECTOR AT T1
1886  REF  10  LAST  543   24,3105   17576 0          STODL   VINIT
1887  REF   6  LAST  633   24,3106   01205 1                  PIPTIME
1888  REF   2  LAST  119   24,3107   03474 0          STORE   TNIT
1889                       24,3110   77621 1          BDSU
1890  REF   9  LAST  631   24,3111   03656 1                  TPASS4
1891  REF   9  LAST  631   24,3112   27423 1          STOVL   DELLT4
1892  REF  16  LAST  645   24,3113   15332 1                  HI6ZEROS
1893  REF   5  LAST  653   24,3114   17351 0          STODL   DELVSUM
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1894	REF	17	LAST	653	24,3115	15332	1		HI6ZEROS	
1895	REF	6	LAST	653	24,3116	03347	1	STORE	NBRCYCLS	
1896					24,3117	77650	1	GOTO		
1897	REF	2	LAST	652	24,3120	51047	0		CALL4C.8	
1898	REF	39	LAST	653	E6,1466			EBANK=	DAPDATR1	
1899	REF	143	LAST	653	24,3121	0 6006	1	STEERING TC	INTPRET	
1900					24,3122	77624	1	CALL		
1901	REF	2	LAST	642	24,3123	51020	1		UPDATEVG	
1902					24,3124	77776	1	EXIT		
1903	REF	23	LAST	650	24,3125	3 4702	0	CAF	BIT9	CHECK IMPULSW
1904	REF	13	LAST	650	24,3126	7 0076	1	MASK	FLAGWRD2	
1905	REF	149	LAST	651	24,3127	10 000	0	CCS	A	
1906					24,3130	1 3133	1	TCF	+3	PRE-IGNITE, REQUEST ENG-OFF, OR POST-OFF
1907	REF	41	LAST	646	24,3131	0 4574	0	SERVXT TC	POSTJUMP	
1908	REF	3	LAST	643	24,3132	77136	0	CADR	SERVEXIT	
1909	REF	27	LAST	651	24,3133	3 4676	1	CAF	BIT13	CHECK ENGINE-ON/-OFF
1910					24,3134	0 0006	1	EXTEND		
1911	REF	24	LAST	651	24,3135	02 011	0	RAND	DSALMOUT	
1912					24,3136	0 0006	1	EXTEND		
1913	REF	3	LAST	645	24,3137	1 3131	0	BZF	SERVXT	ENGINE-OFF, SO PRE-IGNITE OR POST-OFF
1914	REF	3	LAST	650	24,3140	0 3306	1	TCR	E7SETTER	
1916	REF	53	LAST	650	E7,1412			EBANK=	TIG	
1917					24,3141	0 0004	0	INHINT		
1918					24,3142	0 0006	1	EXTEND		
1919	REF	54	LAST	654	24,3143	3 1413	0	DCA	TIG	
1920	REF	268	LAST	644	24,3144	52 155	1	DXCH	MPAC	
1921					24,3145	0 0006	1	EXTEND		
1922	REF	22	LAST	651	24,3146	4 0025	1	DCS	TIME2	
1923	REF	269	LAST	654	24,3147	20 155	1	DAS	MPAC	
1924	REF	1			24,3150	0 7224	1	TCR	DPAGREE	
1925	REF	270	LAST	654	24,3151	30 155	0	CAE	MPAC +1	(LESS THAN 6 (OR 4) SECONDS TO GO)
1926	REF	150	LAST	654	24,3152	10 000	0	CCS	A	PROTECT AGAINST NEG/ZRO W.L. CALL
1927					24,3153	1 3156	1	TCF	+3	
1928					24,3154	1 3156	1	TCF	+2	
1929	REF	130	LAST	652	24,3155	3 4714	1	CAF	ZERO	
1930	REF	80	LAST	652	24,3156	6 4712	1	AD	ONE	
1931	REF	66	LAST	649	24,3157	56 001	0	XCH	L	
1932	REF	131	LAST	654	24,3160	3 4714	1	CA	ZERO	
1933	REF	11	LAST	650	24,3161	53*430	0	DXCH	TGO	
1934	REF	12	LAST	654	24,3162	3 1430	1	CA	TGO +1	
1935	REF	30	LAST	650	24,3163	0 5140	1	TC	WAITLIST	
1936	REF	13	LAST	654	E7,1427			EBANK=	TGO	
1937	REF	3	LAST	650	24,3164	C2710	0	2CADR	ENGINOFF	
1937					24,3165	50067	0			
1938	REF	18	LAST	653	24,3166	0 5261	1	TC	2PHSCHNG	
1939					24,3167	40153	1	OCT	40153	A, 3.15 = ENGINOFF (TGO+1)....NOTE GROUP
1940					24,3170	10035	0	OCT	10035	B, 5.3 = REREADAC, AND START BELOW
19402	REF	42	LAST	641	24,3171	0 5447	0	TC	DOWNFLAG	CLEAR IMPULSW, ENGINOFF IS NOW SET UP
19403	REF	2	LAST	198	24,3172	00044	1	ADRES	IMPULSW	RESTARTS OK

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1941 REF 4 LAST 654 24,3173 1 3131 C TCF SERVXT

P1942 RCLTINE **CLOKTASK** DESCRIPTION

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19542  REF  55  LAST  654   E7,1412                          EBANK=  TIG
1955   REF  20  LAST  652   24,3174   3 4700 1  CLOKTASK  CAF     BIT11       IS TIMRFLAG SET
1956   REF   7  LAST  652   24,3175   7 0103 1            MASK    FLAGWRD7
1957   REF 151  LAST  654   24,3176  10 000  C            CCS     A
1958   REF   1               24,3177   1 3203 1            TCF     CLOCKON
1959   REF  49  LAST  653   24,3200   0 5301 C            TC      PHASCHNG
1960                         24,3201    00006 1            OCT     00006       KILL RESTART
1961   REF  33  LAST  651   24,3202   0 5213 1            TC      TASKOVER

1962                         24,3203   0 0006 1  CLOCKON   EXTEND
1963   REF  23  LAST  654   24,3204   3 0025 C            DCA     TIME2
1964   REF   7  LAST  274   24,3205  53'661  C            DXCH    TTOGC
1965                         24,3206   0 0006 1            EXTEND
1966   REF  56  LAST  656   24,3207   4 1413 1            DCS     TIG
1967   REF   8  LAST  656   24,3210  21'661  C            DAS     TTOGC

1968   REF  10  LAST  651   24,3211   3 4734 C  SETCLOCK  CAF     1SEC
1969   REF  31  LAST  654   24,3212   0 5140 1            TC      WAITLIST
1970   REF  57  LAST  656   E7,1412                          EBANK=  TIG
1971   REF   5  LAST  638   24,3213    03174 C            2CADR   CLOKTASK
1971                         24,3214    50067 C

1972   REF  10  LAST  652   24,3215  11'145  1            CCS     NVWORD1
1973                         24,3216   1 3221 1            TCF     +3
1974   REF   1               24,3217   1 3231 C            TCF     SETTB6

19742                        24,3220   1 3221 1            TCF     +1
1975   REF   2  LAST  641   24,3221   4 2347 1            CS      V06N85B     CHECK FOR V06N85B (P41)
19752  REF  11  LAST  656   24,3222   6 1145 C            AD      NVWORD1
19753                        24,3223   0 0006 1            EXTEND
19754  REF   1               24,3224   1 3234 C            BZF     SETUPDYN    V06N85, SO UPDATE N85 FOR DYNAMIC DISP

1976   REF   2  LAST  573   24,3225   3 7664 1            CAF     PRIO27
1977   REF  22  LAST  651   24,3226   0 5027 1            TC      NOVAC
1978   REF  40  LAST  654   E6,1466                          EBANK=  DAPDATR1
1979   REF   1               24,3227    03246 1            2CADR   CLOCKJOB
1979   REF   1               24,3230    50066 1
1980   REF  12  LAST  530   24,3231   4 0025 1  SETTB6    CS      TIME1       SET GROUP6 TIMEBASE
1981   REF   1               24,3232  55'065  1            TS      TBASE6
1982   REF  34  LAST  656   24,3233   1 5213 C            TCF     TASKOVER

19822  REF   3  LAST  656   24,3234   3 7664 1  SETUPDYN  CAF     PRIO27      SET UP A JOB TO UPDATE N85 (FOR P41=V06)
198222 REF  24  LAST  653   24,3235   0 5042 1            TC      FINDVAC
198224 REF  41  LAST  656   E6,1466                          EBANK=  DAPDATR1
198226 REF   1               24,3236    03241 C            2CADR   DYNDISP
198226 REF   1               24,3237    50066 1
198228 REF   2  LAST  656   24,3240   1 3231 C            TCF     SETTB6      CLOSE OUT CLOCKTASK
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19823  REF 144  LAST  654   24,3241  0 6006 1  DYNDISP  TC      INTPRET      UPDATE N85 FOR A DYNAMIC V06N85 IN P41,
198232                      24,3242   77624 1             CALL                 PRIOR TO BLANKING AND AVEG (V16N85)
198234  REF   3  LAST  642   24,3243   50314 1                     P40CNV85
198236                      24,3244   77776 1             EXIT
198238  REF   1             24,3245  1 3256 1             TCF     CKNVWRD1
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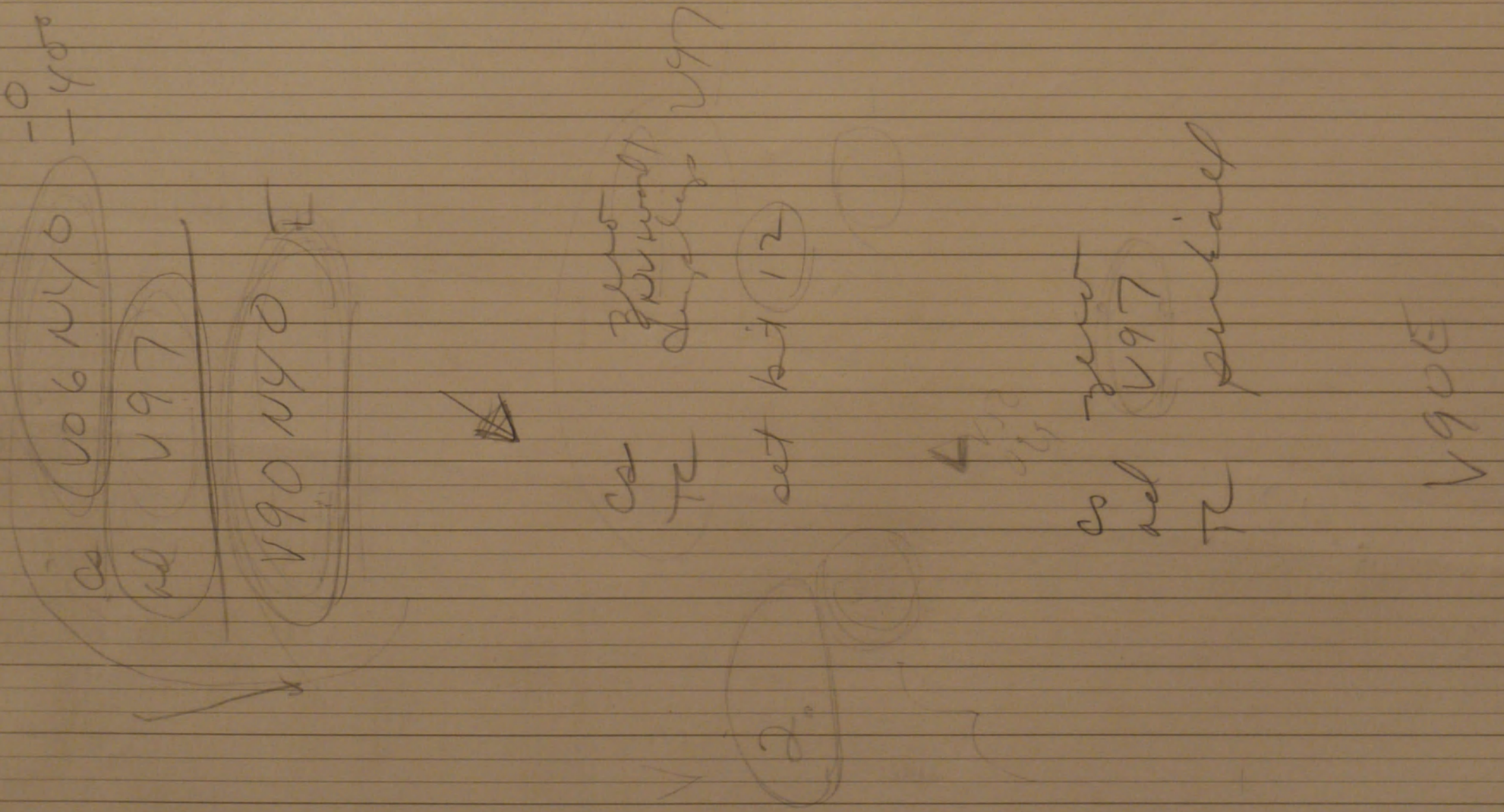

P1983 RCLTINE **CLOCKJOB** DESCRIPTION

```
2003   REF  42  LAST  656   E6,1466                      EBANK=  DAPDATR1
2004   REF  15  LAST  648   24,3246   3 0032 0  CLOCKJOB  CA      CDUX
2004C1 REF   1               24,3247  54 772 1           TS      CDUSPOTX
2004C2 REF   6  LAST  64C   24,3250   3 0033 1           CA      CDUY
2004C3 REF   1               24,3251  54 766 1           TS      CDUSPOTY
2004C4 REF   9  LAST  561   24,3252   3 0034 0           CA      CDUZ
2004C5 REF   1               24,3253  54 770 0           TS      CDUSPOTZ
2004C6 REF 169  LAST  645   24,3254   0 4555 0           TC      BANKCALL
20041  REF   1               24,3255   47510 0           CADR    QUICTRIG
20042                        24,3256   0 0004 0  CKNVWRD1 INHINT
20044  REF  12  LAST  656   24,3257  11'145 1           CCS     NVWORD1     DETERMINE FUNCTION, INDICATED BY NVWORD1
2005   REF   1               24,3260   1 3303 0           TCF     NOFLASH
2006   REF  82  LAST  644   24,3261   1 5112 1           TCF     ENDOFJOB
2007   REF   1               24,3262   1 3272 1           TCF     ENGREQST    SPS ENGINE-ON-ENABLE V99 FLASH
2008   REF   4  LAST  648   24,3263   3 2351 1  FAILDSP  CAF     V06N40      SPS ENGINE-FAILED V97 FLASH
2009   REF 170  LAST  658   24,3264   0 4555 0           TC      BANKCALL
2010   REF  13  LAST  626   24,3265    20763 1           CADR    GOFLASHR    LINUS MAKES IT A REDO,  INHINT OK
2011   REF   1               24,3266   1 3352 1           TCF     V97T        TERMINATE
2012   REF   1               24,3267   1 3405 1           TCF     V97P        PROCEED
2013   REF   1               24,3270   1 3434 0           TCF     V97E        ENTER
2014   REF   1               24,3271   1 3300 0           TCF     PASTERET

2015   REF   5  LAST  658   24,3272   3 2351 1  ENGREQST CAF     V06N40
2016   REF 171  LAST  658   24,3273   0 4555 0           TC      BANKCALL
2017   REF  14  LAST  658   24,3274    20763 1           CADR    GOFLASHR    LINUS MAKES IT A REDO,  INHINT OK
2018   REF   1               24,3275   1 3322 0           TCF     V99T        TERMINATE
2019   REF   1               24,3276   1 3330 0           TCF     V99P        PROCEED
2020   REF   1               24,3277   1 3314 0           TCF     V99E        ENTER

2021   REF   1               24,3300   3 2352 1  PASTERET CAF     P40OK99     IMMED RETURN - SET UP V99 OR V97
2022   REF   2  LAST  382   24,3301   0 5415 1           TCR     LINUS
2023   REF  83  LAST  658   24,3302   1 5112 1           TCF     ENDOFJOB

2024   REF  13  LAST  658   24,3303  31'145 0  NOFLASH  CAE     NVWORD1     DISPLAY NVWORD1 NORMALLY
2025   REF 172  LAST  658   24,3304   0 4555 0           TC      BANKCALL
2026   REF   1               24,3305    20616 1           CADR    REGODSP

2027   REF   5  LAST  636   24,3306   3 4753 1  E7SETTER CAF     EBANK7
2028   REF  31  LAST  636   24,3307  54 003 0           TS      EBANK
2029   REF  58  LAST  656   E7,1412                      EBANK=  TIG
2030   REF 163  LAST  652   24,3310   0 0002 0           TC      Q

2031   REF  10  LAST  562   24,3311   3 4752 0  E6SETTER CAF     EBANK6      SET UP EBANK6
2032   REF  32  LAST  658   24,3312  54 003 0           TS      EBANK
2033   REF  43  LAST  658   E6,1466                      EBANK=  DAPDATR1
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2034   REF 164  LAST 658   24,3313  0 0002 0          TC     Q

20345  REF  44  LAST 658   E6,1466                    EBANK= DAPDATR1
2035   REF  19  LAST 654   24,3314  0 5261 1 V99E     TC     2PHSCHNG
2036                       24,3315   00006 1          OCT    00006        KILL PRE40.6/CLOCKTASK PROTECTION
2037                       24,3316   05024 1          OCT    05024        C, PRIORITY NEXT, JOB BELOW
20372                      24,3317   27000 1          OCT    27000
2038   REF   3  LAST 651   24,3320  0 3004 0 V99EJOB  TCR    TVCZAP -1    WIPE OUT TVC, CLOKTASK
2039   REF   2  LAST 639   24,3321  1 2163 0          TCF    P40RCS       V16N85 POST-BURN OPERATIONS

20392  REF  45  LAST 659   E6,1466                    EBANK= DAPDATR1
2040   REF  20  LAST 659   24,3322  0 5261 1 V99T     TC     2PHSCHNG     (ENTRY FROM V97T FLOW TOO)
2041                       24,3323   00006 1          OCT    00006        KILL PRE40.6/CLOCKTASK PROTECTION
2042                       24,3324   05024 1          OCT    05024        C, PRIORITY NEXT, JOB BELOW
20422                      24,3325   27000 1          OCT    27000
2043   REF   4  LAST 659   24,3326  0 3004 0 V99TJOB  TCR    TVCZAP -1    WIPE OUT TVC, CLOKTASK
2044   REF   5  LAST 640   24,3327  1 2204 1          TCF    POST41       AVEGEXIT, SETMAXDB, GOTOPOOH

2045                       24,3330  0 0004 0 V99P     INHINT
2046   REF   8  LAST 656   24,3331  30 103 0          CAE    FLAGWRD7     CHECK ASTN FLAG FOR PRIOR V99P
2047   REF  24  LAST 648   24,3332  7 4677 1          MASK   BIT12
2048   REF 152  LAST 656   24,3333  10 000 0          CCS    A
20485  REF   1             24,3334  1 3347 0          TCF    V99P/TIG     YES, THIS MUST BE A RESTART ENTRY

20486  REF  25  LAST 659   24,3335  3 4677 0 ASTNV99P CAF    BIT12        SET ASTN FLAG
20487  REF   9  LAST 659   24,3336  26 103 1          ADS    FLAGWRD7
2051   REF  10  LAST 659   24,3337  30 103 0          CAE    FLAGWRD7     CHECK IGN FLAG FOR TIG-0 ARRIVAL
2052   REF  28  LAST 654   24,3340  7 4676 0          MASK   BIT13
2053                       24,3341  0 0006 1          EXTEND
2054   REF   2  LAST 659   24,3342  1 3347 0          BZF    V99P/TIG     NO, CLEAR THE V99 AND WAIT FOR TIG-0

2055   REF  43  LAST 652   24,3343  3 4712 1 ENDV99PI CAF    BIT1         TIG-0 HAS COME ALREADY
2056   REF  32  LAST 656   24,3344  0 5140 1          TC     WAITLIST     SET UP IGNITION HERE
2057   REF  46  LAST 659   E6,1466                    EBANK= DAPDATR1
2058   REF   2  LAST 209   24,3345   02554 1          2CADR  IGNITION
2058                       24,3346   50066 1
20605  REF   6  LAST 658   24,3347  3 2351 1 V99P/TIG CAF    V06N40       CLEAR THE V99 FLASH AND WAIT FOR TIG-0
20606  REF  14  LAST 658   24,3350  55'145 1          TS     NVWORD1
2061   REF  64  LAST 658   24,3351  1 5112 1 ENDV99P  TCF    ENDOFJOB

20665  REF   6  LAST 651   E6,1474                    EBANK= CSMMASS
2067   REF  21  LAST 659   24,3352  0 5261 1 V97T     TC     2PHSCHNG
2068                       24,3353   00006 1          OCT    00006        KILL GROUP 6 (CLOKTASK)
2069                       24,3354   40674 0          OCT    40674        A, 4.67 = V97TTASK (-0 CS), TBASE NOW
2070   REF  44  LAST 659   24,3355  3 4712 1          CAF    BIT1
2071   REF   4  LAST 427   24,3356  0 5130 0          TC     TWIDDLE
2072   REF   2  LAST 209   24,3357   03361 0          ADRES  V97TTASK     KEEP EBANK6 FOR MASSES, SPSOFF, ETC.
2073   REF  85  LAST 659   24,3360  1 5112 1          TCF    ENDOFJOB
```

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2074  REF   7  LAST  659  E6,1474                          EBANK= CSMMASS
2075  REF 132  LAST  654  24,3361  3 4714 1  V97TTASK CAF   ZERO      DISABLE CLOCKJOB
2076  REF  15  LAST  659  24,3362  55'145 1        TS    NVWORD1
2077  REF   1              24,3363  3 2363 0        CAF   3MDOT      3 SECONDS OF MDOT (2-4 SEC ENGFAIL
2078  REF   8  LAST  660  24,3364  6 1474 1        AD    CSMMASS       DETECTION) NOT LOST BECAUSE THRUST
2079  REF   5  LAST  651  24,3365  55'662 0        TS    MASSTMP       FAILED.  COPYCYCLE FOR MASSBACK
2080  REF  50  LAST  656  24,3366  0 5301 0        TC    PHASCHNG
2081                      24,3367   05014 1        OCT   05014     C, DELTAT NEXT, TASK BELOW, IN
2082                      24,3370   77777 0        DEC   -0        -0 CS

2083  REF   3  LAST  650  24,3371  0 2741 1        TCR   SPSOFF    SHUTDOWN SPS ENGINE, MASS UPDATE, ETC.
2084  REF  51  LAST  660  24,3372  0 5301 0        TC    PHASCHNG
2085                      24,3373   00714 0        OCT   00714     A, 4.71 = V97TRCS (250 CS), TBASE OLD
2086  REF   4  LAST  651  24,3374  0 5156 0        TC    FIXDELAY  DELAY 2.5 SECONDS FOR (POSSIBLE) TAIL-
2087                      24,3375   00372 1        DEC   250           OFF (FALSE THRUST-LOSS)

2088  REF  47  LAST  659  E6,1466                          EBANK= DAPDATR1
2089  REF  28  LAST  651  24,3376  0 4633 0  V97TRCS  TC    IBNKCALL  RCS DAP IN 0.6SEC, SETTING T5 BITS TO
2090  REF   3  LAST  651  24,3377   42010 0        CADR  RCSDAPON        KILL TVCEXEC/TVCROLLDAP STARTS
2091  REF   4  LAST  656  24,3400  3 7664 1        CAF   PRIO27    SET UP V99T FOR TVCZAP AND POST41 (SET-
2092  REF  23  LAST  656  24,3401  0 5027 1        TC    NOVAC         MAXDB AND GOTOPOOH)
2093  REF  48  LAST  660  E6,1466                          EBANK= DAPDATR1  EBANK6 FOR SETMAXDB IN POST41
2094  REF   2  LAST  658  24,3402   03322 1        2CADR V99T
2094                      24,3403   50066 1
2095  REF  35  LAST  656  24,3404  1 5213 0  ENDV97T  TCF   TASKOVER


2096  REF   4  LAST  651  E6,1444                          EBANK= V97VCNTR
2097  REF  52  LAST  660  24,3405  0 5301 0  V97P      TC    PHASCHNG
2098                      24,3406   40734 0        OCT   40734     A, 4.73 = V97PTASK (-0 CS), TBASE NOW
2099  REF  45  LAST  659  24,3407  3 4712 1        CAF   BIT1
2100  REF   5  LAST  659  24,3410  0 5130 0        TC    TWIDDLE
2101  REF   2  LAST  209  24,3411   03413 1        ADRES V97PTASK
2102  REF  86  LAST  659  24,3412  1 5112 1        TCF   ENDOFJOB

2103  REF   5  LAST  660  E6,1444                          EBANK= V97VCNTR
2104  REF   6  LAST  660  24,3413  31'444 1  V97PTASK CAE   V97VCNTR  GET MASS UPDATES (TVCEXEC) GOING AGAIN
2105  REF   2  LAST  102  24,3414  55'653 1        TS    VCNTR           (ERRORS IF FLASE THRUST-LOSS AND/OR
A2106                                                                   POOR SYNCH OF MANUAL ENGINE-ON AND
A2107                                                                   THE VERB 97 PROCEED)
2108  REF   7  LAST  659  24,3415  3 2351 1        CAF   V06N40    REDISPLAY V06N40
2109  REF  16  LAST  660  24,3416  55'145 1        TS    NVWORD1
2110  REF  41  LAST  641  24,3417  0 5435 0        TC    UPFLAG    SET IDLEFAIL TO ALLOW R41-BYPASS, IN
2111  REF   1              24,3420   00030 1        ADRES IDLEFAIL        CASE OF UNFAVORABLE S40.8 SYNCH
2112  REF  42  LAST  660  24,3421  0 5435 0        TC    UPFLAG    SET STEERSW TO RE-ENABLE STEERING
2113  REF   1              24,3422   00042 1        ADRES STEERSW
2114  REF  53  LAST  660  24,3423  0 5301 0        TC    PHASCHNG
2115                      24,3424   00134 1        OCT   00134     A, 4.13 = R40ENABL (200 CS), TBASE OLD
2116  REF   5  LAST  660  24,3425  0 5156 0        TC    FIXDELAY  WAIT 2 SECONDS, THEN
2117                      24,3426   00310 0        DEC   200
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2118   REF   5  LAST  620   E7,1777                          EBANK=  WHOCARES
2119   REF  43  LAST  654   24,3427   0 5447 C  R40ENABL     TC      DOWNFLAG      RE-ENABLE R40 BY CLEARING IDLEFAIL
2120   REF   2  LAST  660   24,3430    00030 1               ADRES   IDLEFAIL
2121   REF  54  LAST  660   24,3431   0 5301 C               TC      PHASCHNG
2122                        24,3432    00004 C               OCT     00004         KILL GROUP 4
2123   REF  36  LAST  660   24,3433   1 5213 C  ENDV97P      TCF     TASKOVER


2124   REF   6  LAST  661   E7,1777                          EBANK=  WHOCARES
2125   REF  55  LAST  661   24,3434   0 5301 C  V97E         TC      PHASCHNG
2126                        24,3435    40534 1               OCT     40534         A, 4.53 = V97ETASK (-0 CS), TBASE NOW
2127   REF  46  LAST  660   24,3436   3 4712 1               CAF     BIT1
2128   REF  33  LAST  659   24,3437   0 5140 1               TC      WAITLIST
2129   REF  59  LAST  658   E7,1412                          EBANK=  TIG
2130   REF   2  LAST  209   24,3440    03443 1               2CADR   V97ETASK
2130                        24,3441    50067 C
2131   REF  67  LAST  660   24,3442   1 5112 1               TCF     ENDOFJOB


2132   REF  60  LAST  661   E7,1412                          EBANK=  TIG
2133   REF   5  LAST  232   24,3443   4 4112 C  V97ETASK     CS      OCT24         FORCE R1 OF V06N40 TO READ  59X59
2134   REF  61  LAST  661   24,3444   55'412 C               TS      TIG
2135   REF   8  LAST  660   24,3445   3 2351 1               CAF     V06N40        REDISPLAY V06N40
2136   REF  17  LAST  660   24,3446   55'145 1               TS      NVWORD1
2137   REF   3  LAST  650   24,3447   0 3311 1               TCR     E6SETTER      RETURN TO EBANK6 FOR REST OF V97ETASK
2138   REF   9  LAST  660   E6,1474                          EBANK=  CSMMASS
2139   REF   2  LAST  660   24,3450   3 2363 C               CAF     3MDOT         3 SECONDS OF MDOT (2-4 SEC ENGFAIL
2140   REF  10  LAST  661   24,3451   6 1474 1               AD      CSMMASS             DETECTION) NOT LOST BECAUSE THRUST
2141   REF   6  LAST  660   24,3452   55'662 C               TS      MASSTMP             FAILED....COPYCYCLE FOR MASSBACK
2142   REF  56  LAST  661   24,3453   0 5301 C               TC      PHASCHNG
2143                        24,3454    00754 1               OCT     00754         A, 4.75 = SPSOFF97 (-0 CS), TBASE OLD
2145   REF   4  LAST  660   24,3455   0 2741 1  SPSOFF97     TCR     SPSOFF
2146   REF  57  LAST  661   24,3456   0 5301 C               TC      PHASCHNG
2147                        24,3457    00114 C               OCT     00114         A, 4.11 = V97E40.6 (250 CS), TBASE OLD
2148   REF   6  LAST  660   24,3460   0 5156 C               TC      FIXDELAY      DELAY 2.5 SECONDS  FOR (POSSIBLE) TAIL-
2149                        24,3461    00372 1               DEC     250                 OFF (FALSE THRUST-LOSS)

2150   REF  49  LAST  660   E6,1466                          EBANK=  DAPDATR1
2151   REF  47  LAST  661   24,3462   3 4712 1  V97E40.6     CAF     BIT1
2152   REF  34  LAST  661   24,3463   0 5140 1               TC      WAITLIST
2153   REF   2  LAST  638   E6,1447                          EBANK=  CNTR
2154   REF   2  LAST  211   24,3464    02040 1               2CADR   PRE40.6       USE S40.6 RESTART ENTRY TO TRIM ENGINE
2154                        24,3465    40066 C
2155   REF  29  LAST  660   24,3466   0 4633 C               TC      IBNKCALL      RCS DAP IN 0.6SEC, SETTING T5 BITS TO
2156   REF   4  LAST  660   24,3467    42010 C               CADR    RCSDAPON            KILL TVCEXEC/TVCROLLDAP STARTS.
A2157                                                                               LEAVE NARROW DEADBAND FOR REIGNITE
2158   REF  22  LAST  659   24,3470   0 5261 1               TC      2PHSCHNG
2159                        24,3471    00026 C               OCT     00026         A, 6.2 = PRE40.6 (-0CS), CLOKTASK (1SEC)
2160                        24,3472    05014 1               OCT     05014         C, DELTAT NEXT, TASK BELOW, IN
21602                       24,3473    77777 C               DEC     -0            -0 CS
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 2161   REF   5  LAST  643   24,3474   4 4761 1  QUICKIGN CS    PRIC14    CLEAR ASTNFLAG AND SET IGNFLAG FOR
 2162   REF  11  LAST  659   24,3475   7 0103 1           MASK  FLAGWRD7        IMMEDIATE V99 RESPONSE
 2163   REF  29  LAST  659   24,3476   6 4676 1           AD    BIT13
 2164   REF  12  LAST  662   24,3477   54 103 1           TS    FLAGWRD7
 2165   REF   7  LAST  661   24,3500   0 5156 C           TC    FIXDELAY  DELAY TO ALLOW TIME FOR PRE40.6
 2166                        24,3501    00036 1           DEC   30

 2167   REF  24  LAST  654   24,3502   4 4702 1  V99FLASH CS    BIT9      CAUSE V99 TO FLASH
 2168   REF  18  LAST  661   24,3503   55'145 1           TS    NVWORD1
 2169   REF  23  LAST  661   24,3504   0 5261 1           TC    2PHSCHNG
 2170                        24,3505    40774 1           OCT   40774     A, 4.77 = TIG-0 (-OCS) TBASE FOR PREPTVC
 2171                        24,3506    00033 1           OCT   00033     A, 3.3 = S40.13 (PRIO 20)
 2172   REF   6  LAST  647   24,3507   3 4675 1           CAF   PRIC20    SET UP TIMEBURN
 2173   REF  25  LAST  656   24,3510   0 5042 1           TC    FINDVAC
 2174   REF  14  LAST  654   E7,1427                      EBANK= TGO
 2175   REF   3  LAST  647   24,3511    02404 C           2CADR S40.13
 2175                        24,3512    34067 1
 2176   REF  37  LAST  661   24,3513   1 5213 C  ENDV97E  TCF   TASKOVER  WAIT FOR CLOCKJOB (IMMEDIATE) REACTION
A2177                                                                    TO FLASHING V99 RESPONSE


R2178   MCD NO2          LOG SECTION  P40-P47
R2179   MCD BY   ZELDIN
R2180   FUNCTIONAL DESCRIPTION
R2181           COMPUTE INITIAL THRUST DIRECTION(UT) AND INITIAL VALUE OF VG
R2182           VECTOR(VGTIG).
R2183   CALLING SEQUENCE
R2184         L CALL
R2185       L+1        S40.1
R2186   NORMAL EXIT MODE
R2187           AT L+2 OF CALLING SEQUENCE (GOTO L+2)  NORMAL RETURN OR
R2188           ERROR RETURN IF NOSOFLAG =1
R2189   SUBROUTINES CALLED
R2190           CSMPREC
R2191           INITVEL
R2192           CALCGRAV
R2193           MIDGIM
R2194   ALARM OR ABORT EXIT MODES
R2195       L+2 OF CALLING SEQUENCE,UNSOLVABLE CONIC IF NOSOFLAG=1
R2196   ERASABLE INITIALIZATION REQUIRED
R2197           WEIGHT/G   ANTICIPATED MAG. OF VEHICLE MASS      SP B16KGM
R2198           XDELVFLG       1=DELTA-V MANEUVER,0=AIMPT STEER
R2199         IF DELTA-V MANEUVER
R2200           DELVSIN    SPECIFIED DELTA-V REQUIRED IN
R2201                      INERTIAL COORDS. OF ACTIVE VEHICLE
R2202                      AT TIME OF IGNITION                  VECTOR B7M/CS
R2203           DELVSAB    MAG. OF DELVSIN                      DP     B7M/CS
R2204           RTIG       POSITION AT TIME OF IGNITION       VECTOR B29M
R2205           VTIG       VELOCITY AT TIME OF IGNITION       VECTOR B7M/CS
R2206           CSTEER = 0              DP
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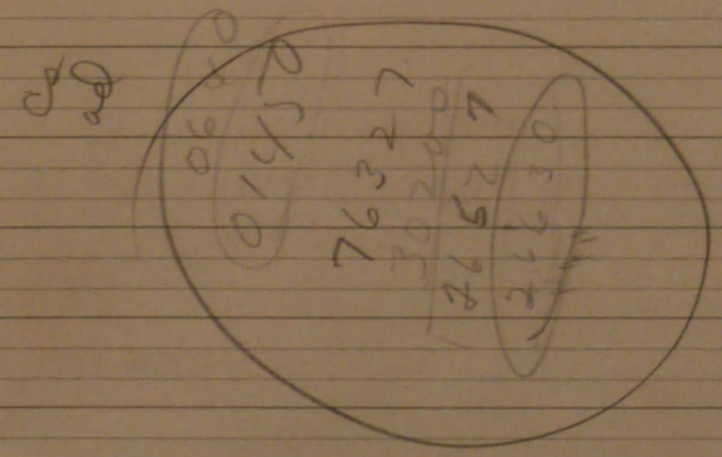

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R2207          IF AIMPOINT STEERING
R2208          IF AIMPT STEER
R2209             TIG       TIME OF IGNITION                    DP      B28CS
R2210             R1ARG     POSITION TARGET TIME                VECTOR B29M
R2211             CSTEER = ECSTEER(GR 0) DP B1
R2212             TPASS4 - TIME OF ARRIVAL AT AIMPOINT
R2213    OUTPUT
R2214             UT    1/2 UNIT VECTOR ALIGNED WITH THRUST DIRECTION IN REF COOR
R2215          VGTIG        INITIAL VALUE OF VELOCITY
R2216                       TO BE GAINED (INERT. COORD.)          VECTOR B7M/CS
R2217          DELVLVC      VGTIG IN LOC. VERT. COORDS.                B7M/CS
R2218             F         NOMINAL THRUST FOR ENG USED FOR S40.13  DP B7 M-NEWT
R2219             BDT   V REQUIRED AT TIG -V REQUIRED AT (TIG-2SEC)
R2220             -GDT  FOR S40.13                                  VECT  B7M/CS
R2221          RTIG         CALC IN S40.1B(AIMPT) FOR S40.2,3  VECTOR B29M
R2222                       POSITION AT TIME OF IGNITION
R2223    DEBRIS      QTEMP1
R2224          MPAC,QPRET
R2225          PUSHLIST
R2226             R1X2,RTX1
 2227                        14,2002                 BANK   14
 2228    REF   1             16,2000                 SETLOC P40S1
 2229                        16,2000                 BANK
 2230    REF   1                                     COUNT  16/S40.1

 2231                        16,2000   77214 C  S40.1   SET    VLOAD
 2232    REF   2  LAST  653  16,2001   01070 1          FIRSTFLG
 2233    REF   1             16,2002   11453 C          LOADZEROS
 2234    REF   3  LAST  653  16,2003   03705 C          STORE  BDT
 2235                        16,2004   43020 1          STQ    BOF
 2236    REF   8  LAST  631  16,2005   03657 C          QTEMP
 2237    REF   7  LAST  652  16,2006   01347 C          XDELVFLG
 2238    REF   1             16,2007   34073 1          S40.1B      LAMBERT
 2239                        16,2010   77201 1          SETPD  VLOAD       EXTERNAL DELTA V
 2240                        16,2011   00001 C                 0
 2241    REF   5  LAST  629  16,2012   03640 C                 VTIG
 2242    REF  11  LAST  653  16,2013   03576 C          STORE  VINIT
 2243                        16,2014   53435 C          VXV    UNIT
 2244    REF   6  LAST  630  16,2015   03632 C                 RTIG
 2245    REF   2  LAST  121  16,2016   27713 1          STOVL  UT          UP IN UT
 2246    REF   7  LAST  663  16,2017   03632 C                 RTIG
 2247    REF  12  LAST  653  16,2020   03570 C          STORE  RINIT
 2248                        16,2021   65236 C          VSQ    PDDL
 2249                        16,2022   00045 C                 36D
 2250                        16,2023   56205 C          DMP    DDV
 2251    REF   1             16,2024   34127 1                 THETACON
 2252                        16,2025   41205 C          DMP    DMP
 2253    REF   3  LAST  120  16,2026   03654 C                 DELVSAB
 2254    REF   2  LAST   99  16,2027   03076 C                 WEIGHT/G
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2255					16,2030	77671	1	DDV	
2256	REF	3	LAST	637	16,2031	03727	0		F
2257					16,2032	24017	1	STOVL	14D
2258	REF	9	LAST	629	16,2033	03646	0		DELVSIN
2259					16,2034	74241	0	DOT	VXSC
2260	REF	3	LAST	663	16,2035	03713	1		UT
2261	REF	4	LAST	664	16,2036	03713	1		UT
2262					16,2037	41552	0	VSL2	PUSH (DELTAV.UP)UP SCALED AT 2(+7) P.D.L. 0
2263					16,2040	65245	1	BVSU	PDDL DELTA VP SCALED AT 2(+7) P.D.L. 6
2264	REF	10	LAST	664	16,2041	03646	0		DELVSIN
2265					16,2042	00017	1		14D
2266					16,2043	63356	1	SIN	PDVL
2267					16,2044	00007	0		6D
2268					16,2045	53435	0	VXV	UNIT
2269	REF	5	LAST	664	16,2046	03713	1		UT
2270					16,2047	45561	1	VXSC	STADR
2271	REF	6	LAST	638	16,2050	50056	1	STOVL	VGTIG UNIT(VPXUP)SIN(THETAT)IN VGTIG
2272					16,2051	65256	0	UNIT	PDDL UNIT(DELTA VP) IN P.D.L. 6
2273					16,2052	00017	1		14D
2274					16,2053	74346	0	COS	VXSC
2275					16,2054	74255	0	VAD	VXSC
2276	REF	7	LAST	664	16,2055	03721	0		VGTIG
2277					16,2056	00045	0		36D
2278					16,2057	53352	0	VSL2	VAD
2279					16,2060	77626	0	STADR	
2280	REF	8	LAST	664	16,2061	74056	1	STORE	VGTIG VG IGNITION SCALED AT 2(+7)M/CS
2281					16,2062	77656	1	UNIT	
2282	REF	6	LAST	664	16,2063	27713	1	STOVL	UT THRUST DIRECTION SCALED AT 2(+1)
2283	REF	9	LAST	664	16,2064	03721	0		VGTIG
2284					16,2065	43006	0	PUSH	SET
2285	REF	9	LAST	636	16,2066	01072	0		AVFLAG
2286					16,2067	77624	1	CALL	
2287	REF	2	LAST	631	16,2070	10653	0		MIDGIM VGTIG IN LV COOR AT 2(+7)M/CS IN DELVLVC
2288					16,2071	77650	1	GOTO	
2289	REF	9	LAST	663	16,2072	03657	0		QTEMP
2290					16,2073	45345	1	S40.18 DLOAD	DSU LAMBERT
2291	REF	62	LAST	661	16,2074	03413	1		TIG
2292	REF	1			16,2075	36001	0		TWODT
2293	REF	35	LAST	639	16,2076	14041	1	STODL	TDEC1
2294	REF	10	LAST	653	16,2077	03656	1		TPASS4
2295					16,2100	77625	0	DSU	
2296	REF	36	LAST	664	16,2101	00041	1		TDEC1
2297	REF	10	LAST	653	16,2102	37423	0	STCALL	DELLT4
2298	REF	2	LAST	630	16,2103	61663	0		AGAIN
2299					16,2104	77775	1	VLOAD	
2300	REF	13	LAST	630	16,2105	03612	1		VIPRIME
2301	REF	7	LAST	664	16,2106	17713	1	STODL	UT
2302	REF	63	LAST	664	16,2107	03413	1		TIG

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2303  REF  37  LAST  664   16,2110  C0041 1            STORE   TDEC1
2304                       16,2111  77621 1            BDSU
2305  REF  11  LAST  664   16,2112  03656 1                    TPASS4
2306  REF  11  LAST  664   16,2113  37423 C            STCALL  DELLT4
2307  REF   3  LAST  664   16,2114  61663 C                    AGAIN
2308                       16,2115  41575 C            VLOAD   PUSH
2309  REF  16  LAST  631   16,2116  03646 C                    DELVEET3
2310  REF  10  LAST  664   16,2117  03721 C            STORE   VGTIG
2311                       16,2120  45014 C            SET     CALL
2312  REF  10  LAST  664   16,2121  01072 C                    AVFLAG
2313  REF   3  LAST  664   16,2122  10653 C                    MIDGIM
2314                       16,2123  52001 1            SETPD   GOTO
2315                       16,2124  00001 C                    0
2316  REF   1              16,2125  61716 C                    CALCUT

2317                       16,2126  00024 1  THETACON 2DEC    .31830989 B-8
2317                       16,2127  13714 1
2318  REF   1              30,2000                     SETLOC  P40S3
2319                       30,3657                     BANK

2320  REF   1                                          COUNT   24/S40.1

2321                       30,3657  04000 0  EP4(45)H 2DEC    .125
2321                       30,3660  00000 1
2322                       30,3661  00707 1  EP4(10)H 2DEC    .027777777
2322                       30,3662  03434 1
2323                       30,3663  45020 1  AGAIN    STQ     CALL
2324  REF   5  LAST  653   30,3664  03730 0                    QTEMP1
2325  REF   6  LAST  628   30,3665  27022 1                    THISPREC
2326                       30,3666  66134 1            SXA,2   SXA,1
2327  REF  12  LAST  628   30,3667  03746 1                    RTX2
2328  REF  10  LAST  629   30,3670  03745 1                    RTX1
2329                       30,3671  77775 1            VLOAD
2330  REF  21  LAST  629   30,3672  00001 C                    RATT
2331  REF   8  LAST  663   30,3673  03632 C            STORE   RTIG
2332  REF  13  LAST  663   30,3674  27570 C            STOVL   RINIT
2333  REF  17  LAST  628   30,3675  00007 C                    VATT
2334  REF   6  LAST  663   30,3676  03640 C            STORE   VTIG
2335  REF  12  LAST  663   30,3677  03576 C            STORE   VINIT
2336                       30,3700  67201 C            SETPD   SLOAD
2337                       30,3701  00001 C                    0
2338  REF  18  LAST  654   30,3702  15332 1                    HI6ZEROS
2339                       30,3703  43125 0            PDDL    BON
2340  REF   1              30,3704  21660 1                    EP4(45)H
2341  REF   4  LAST  626   30,3705  03705 C                    NORMSW
2342                       30,3706  61711 1                    +3
2343                       30,3707  77745 1            DLOAD
2344  REF   1              30,3710  21662 C                    EP4(10)H
2345                       30,3711  45006 C            PUSH    CALL
2346  REF   3  LAST  543   30,3712  22000 1                    INITVEL
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2347					30,3713	52001 1		SETPD	GOTO
2348					30,3714	00001 0			0
2349	REF	6	LAST	665	30,3715	03730 0			QTEMP1
2350					30,3716	45175 0	CALCGT	VLOAD	CALL
2351	REF	9	LAST	665	30,3717	03632 0			RTIG
2352	REF	2	LAST	526	30,3720	77260 0			CALCGRAV GDELTAT IN MPAC AT 2(+7)M/CS
2353					30,3721	70372 0		VSL1	V/SC
2354	REF	1			30,3722	21761 1			200CS G AT 2(-5) M/CS.CS
2355					30,3723	52315 1		PDVL	VSU
2356	REF	14	LAST	664	30,3724	03612 1			VIPRIME
2357	REF	8	LAST	664	30,3725	03713 1			UT
2358					30,3726	52341 0		V/SC	VSU
2359	REF	2	LAST	666	30,3727	21761 1			200CS
2360					30,3730	72561 0		VXSC	VSL2
2361	REF	5	LAST	641	30,3731	03703 0			CSTEER
2362					30,3732	24015 0		STOVL	12D B.C SCALED AT 2(-5) PDL 12D
2363	REF	11	LAST	665	30,3733	03721 0			VGTIG
2364					30,3734	41456 0		UNIT	PUSH UG PDL 0 SCALED AT 2(+1)
2365					30,3735	74241 0		DOT	VXSC
2366					30,3736	00015 0			12D
2367					30,3737	00001 0			0
2368					30,3740	51352 1		VSL2	BVSU
2369					30,3741	00015 0			12D
2370					30,3742	14015 0		STODL	12D Q PDL 12D SCALED AT 2(-5)
2371	REF	4	LAST	664	30,3743	03727 0			F
2372					30,3744	56261 1		SRR	DDV
2373					30,3745	21605 1			4
2374	REF	3	LAST	663	30,3746	03076 0			WEIGHT/G
2375					30,3747	63316 0		DSQ	PDVL F/MASS SQUARED PDL 6 AT 2(-10)M/(CS.CS)
2376					30,3750	00015 0			12D
2377					30,3751	77636 1		VSQ	
2378					30,3752	75421 1		BDSU	SQRT
2379					30,3753	76561 1		VXSC	VSL1
2380					30,3754	53455 0		VAD	UNIT
2381					30,3755	00015 0			12D
2382	REF	9	LAST	666	30,3756	37713 0		STCALL	UT
2383	REF	10	LAST	664	30,3757	03657 0			QTEMP
2384					30,3760	01440 0	200CS	2DEC	200 B-12
2384					30,3761	00000 1			

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R2385   PROGRAM DESCRIPTION S40.2,3  DATE 15,NOV,66
R2386   MOD NO 2        LOG SECTION P40-P47
R2387   MOD BY ZELDIN
R2388   FUNCTIONAL DESCRIPTION
R2389            COMPUTE GIMBAL ANGLES IF THRUSTING OCCURRED WITH PRESENT IMU
R2390            ORIENTATION, WINGS LEVEL SPACECRAFT,HEADS UP
R2391            COMPUTE X AXIS OF ENGINE BELL
R2392            COMPUTE PREFERRED IMU ORIENTATION(XSCREF)
R2393            FOR THIS CALCULATION,ASSUME X AXIS OF SC ALONG UT INITIALLY,
R2394            YSC=UNIT(XXR),ZSC=UNIT(XX(XXR)) AND ROTATE ENGINE BELL ALONG UT
R2395            NEW SC AXES WILL BE APPROX. WINGS LEVEL AND NEW SC AXES IN REF.
R2396            COORDS. WILL BE PREFERRED IMU ORIENTATION.
R2397            COMPUTE DESIRED THRUST DIRECTION IN SM COORDS.
R2398   CALLING SEQUENCE
R2399         L CALL
R2400       L+1 S40.2,3
R2401   NORMAL EXIT MODE
R2402        AT L+2 OF CALLING SEQUENCE (GOTO L+2)
R2403   SUBROUTINES CALLED
R2404            CALCGA
R2405   ALARM OR ABORT MODES
R2406            NONE
R2407   ERASABLE INITIALIZATION REQUIRED
R2408            PACTOFF      TOTAL PITCH TRIM ANGLE     SP  AT 1.0795111 REV.
R2409            YACTOFF      TOTAL YAW   TRIM ANGLE     SP  AT 1.0795111 REV.
R2410            UT           DESIRED THRUST DIRECTION          VECT.B2M/(CS.CS)
R2411            R11C         POSITION AT TIME OF IGNITION      VECT.    B29M
R2412            ENG2FLAG     ON=RCS OFF=SPS
R2413   OUTPUT
R2414            SCAXIS       UNIT VECT. ALIGNED WITH ENG BELL IN SC COOR B1
R2415            XSCREF       UNIT VECTORS ALIGNED WITH PREFERRED IMU     B1
R2416            YSCREF
R2417            ZSCREF
R2418            GIMBAL ANGLES IN THETAC
R2419            POINTVSM     UNIT VECT ALONG DESIRED THRUST DIRECTION IN SM B1
R2420   DEBRIS
R2421            PUSHLIST,QPRET,MPAC
R2422            QTEMP  TEMP. ERASABLE
 2423                           24,3514                        BANK    24
 2424   REF   2  LAST  637     24,2000                        SETLOC  P40S
 2425                           24,3514                        BANK
 2426   REF   1                                               COUNT*  $$/S40.2
 2427                           24,3514   64375 1  S40.2,3    VLOAD   MXV
 2428   REF  10  LAST  666     24,3515   03713 1              UT
 2429   REF  18  LAST  61C     24,3516   01736 1              REFSMMAT
 2430                           24,3517   44172 0              VSL1    STQ
 2431   REF  11  LAST  666     24,3520   03657 0              QTEMP
 2432   REF   5  LAST  61C     24,3521   03357 0              STORE   POINTVSM        THRUST IN SM AT 2
 2433                           24,3522   43001 1              SETPD   BON
 2434                           24,3523   00001 0                      0
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2435   REF   3  LAST  641   24,3524   00704 1                ENG2FLAG
2436   REF   1              24,3525   51635 0                S40.2,38
2437                        24,3526   77745 1          DLOAD
2438   REF  19  LAST  665   24,3527   15332 1                HI6ZEROS
2439                        24,3530   67206 1          PUSH  SLOAD      ZERO PDL 0
2440   REF   3  LAST  652   24,3531   03027 1                YACTOFF
2441                        24,3532   72405 0          DMP   SL1
2442   REF   1              24,3533   11674 1                TRIMSCAL
2443                        24,3534   41415 1          DAD   PUSH
2444   REF   1              24,3535   11676 0                YBIAS
2445                        24,3536   65346 0          COS   PDDL       COS(Y +YO) PDL 2
2446                        24,3537   41556 1          SIN   PUSH       SIN(Y +YO) PDL 4
2447                        24,3540   77735 0          SLOAD
2448   REF  13  LAST  652   24,3541   03026 0                PACTOFF
2449                        24,3542   72405 0          DMP   SL1
2450   REF   2  LAST  668   24,3543   11674 1                TRIMSCAL
2451                        24,3544   41415 1          DAD   PUSH
2452   REF   1              24,3545   11700 0                PBIAS
2453                        24,3546   65346 0          COS   PDDL       COS(P +PO) PDL 6
2454                        24,3547   41556 1          SIN   PUSH       SIN(P +PO) PDL 80
2455   REF   1              24,3550   14323 0          STODL ZSCREF     SIN(P+PO)
2456                        24,3551   00007 0                6
2457                        24,3552   72405 0          DMP   SL1
2458                        24,3553   00005 1                4
2459                        24,3554   65276 1          DCOMP PDDL       -SIN(Y+YO)COS(P+PO) PDL 10
2460                        24,3555   00007 0                6
2461                        24,3556   72405 0          DMP   SL1
2462                        24,3557   00003 1                2
2463                        24,3560   77666 1          VDEF

2464   REF   1              24,3561   14307 0          STODL XSCREF     PD POINTER AT 6 NEW SC X AXIS SCALED AT
2465   REF   2  LAST  668   24,3562   00323 0                ZSCREF
2466                        24,3563   72405 0          DMP   SL1
2467                        24,3564   00005 1                4
2468                        24,3565   41325 0          PDDL  DMP
2469   REF   3  LAST  668   24,3566   00323 0                ZSCREF
2470                        24,3567   00003 1                2
2471                        24,3570   57552 1          SL1   DCOMP
2472                        24,3571   77666 1          VDEF

2473   REF   4  LAST  668   24,3572   14323 0          STODL ZSCREF     PD POINTER AT 4 NEW SCZ AXIS SCALED AT 2
2474                        24,3573   77666 1          VDEF

2475   REF   1              24,3574   14315 0          STODL YSCREF     PD POINTER ATO NEW SC Y AXIS SCALED AT 2
2476   REF   5  LAST  668   24,3575   00323 0                ZSCREF
2477                        24,3576   65325 0          PDDL  PDDL
2478   REF   2  LAST  668   24,3577   00315 0                YSCREF
2479   REF   2  LAST  668   24,3600   00307 0                XSCREF
2480                        24,3601   77666 1          VDEF
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2481  REF  15  LAST  610   24,3602  27351 0          STOVL  SCAXIS          ENGINE BELL SCALED AT 2
2482  REF  11  LAST  667   24,3603  03713 1                 UT
2483                       24,3604  53515 0          PDVL   UNIT
2484  REF  10  LAST  666   24,3605  03632 0                 RTIG
2485                       24,3606  57435 1          VXV    VCOMP
2486                       24,3607  00001 0                 0
2487                       24,3610  41456 0          UNIT   PUSH
2488                       24,3611  77624 1          CALL
2489  REF   1              24,3612  51654 1                 TSTRXLT
2490                       24,3613  57435 1          VXV    VCOMP
2491                       24,3614  00001 0                 0
2492                       24,3615  63372 1          VSL1   PDVL            2 RF/SC  IN PDL  120
2493  REF   3  LAST  668   24,3616  00307 0                 XSCREF
2494                       24,3617  76505 0          VXM    VSL1
2495                       24,3620  00001 0                 0
2496  REF   4  LAST  669   24,3621  24307 0          STOVL  XSCREF          X OF PREF IMU,X OF SC IN REF COOR. AT 2
2497  REF   3  LAST  668   24,3622  00315 0                 YSCREF
2498                       24,3623  76505 0          VXM    VSL1
2499                       24,3624  00001 0                 0
2500  REF   4  LAST  669   24,3625  24315 0          STOVL  YSCREF          Y OF PREF.IMU,Y OF SC IN REF COOR. AT 2
2501  REF   6  LAST  668   24,3626  00323 0                 ZSCREF
2502                       24,3627  76505 0          VXM    VSL1
2503                       24,3630  00001 0                 0
2504  REF   7  LAST  669   24,3631  00323 0          STORE  ZSCREF          Z OF PREF. IMU,Z OF SC IN REF COOR. AT 2
2505                       24,3632  52001 1          SETPD  GOTO
2506                       24,3633  00001 0                 0
2507  REF  12  LAST  667   24,3634  03657 0                 QTEMP
2508                       24,3635  77775 1  S40.2,3B VLOAD
2509  REF   6  LAST  585   24,3636  15330 0                 UNITX
2510  REF  16  LAST  669   24,3637  27351 0          STOVL  SCAXIS
2511  REF  12  LAST  669   24,3640  03713 1                 UT
2512  REF   5  LAST  669   24,3641  00307 0          STORE  XSCREF
2513                       24,3642  53435 0          VXV    UNIT
2514  REF  11  LAST  669   24,3643  03632 0                 RTIG
2515                       24,3644  34007 1          STCALL 6D
2516  REF   2  LAST  669   24,3645  51654 1                 TSTRXLT
2517  REF   5  LAST  669   24,3646  00315 0          STORE  YSCREF
2518                       24,3647  57435 1          VXV    VCOMP
2519  REF   6  LAST  669   24,3650  00307 0                 XSCREF
2520                       24,3651  77772 0          VSL1
2531  REF   8  LAST  669   24,3652  34323 1          STCALL ZSCREF          ZNB AXIS IN REF COOR
2532  REF  13  LAST  669   24,3653  03657 0                 QTEMP
2533                       24,3654  46145 0  TSTRXLT DLOAD  BHIZ
2534                       24,3655  00045 0                 36D
2535  REF   1              24,3656  51661 1                 BADVCTOR
2536                       24,3657  43575 1          VLOAD  RVQ
2537                       24,3660  00007 0                 6D
2538                       24,3661  53575 0  BADVCTOR VLOAD  UNIT
2539  REF  12  LAST  669   24,3662  03632 0                 RTIG
2540                       24,3663  53515 0          PDVL   UNIT
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 2541  REF   7  LAST  665   24,3664   03640 0            VTIG
 2542                       24,3665   53322 1       VSR3 VAD
 2543                       24,3666   53435 0       VXV  UNIT
 2544  REF  13  LAST  665   24,3667   03713 1            UT
 2545                       24,3670   77676 0       VCOMP
 2546                       24,3671   00007 0       STORE  6D
 2547                       24,3672   77616 0       RVQ
 2548                       24,3673   21215 1 TRIMSCAL 2DEC  1.07975111 B-1
 2548                       24,3674   12215 1
 2549                       24,3675   00053 1 YBIAS  2DEC  +.00263888889  YAW   MECH BIAS (+0.95 DEG, THRUST ON)
 2549                       24,3676   07423 0
 2550                       24,3677   77636 1 PBIAS  2DEC  -.00597222222  PITCH MECH BIAS (-2.15 DEG, THRUST ON)
 2550                       24,3700   44653 1
A2551                                                                    REFERENCE, TRW 68.6520.3.3-40 27FEB,1968
R2552  PROGRAM DESCRIPTION S41.1  DATE 8DEC66
R2553  MOD NO1   LOG SECTION P40-P47
R2554  MOD BY ZELDIN
R2555  FUNCTIONAL DESCRIPTION
R2556           COMPUTE VELOCITY TO BE GAINED INITIALLY IN REF COORDS.
R2557           TO CONTROL COORDS.
R2558  CALLING SEQUENCE
R2559       L   CALL
R2560       L+1         S41.1
R2561  NORMAL EXIT MODE
R2562           AT L +2 OF CALLING SEQUENCE
R2563  SUBROUTINES CALLED:
R2564           CALCSMSC
R2565           CDUTRIG
R2566  ALARM OR ABORT MODES
R2567           NONE
R2568  ERASABLE INITIALIZATION REQUIRED
R2569           VG IN REF. COORD. POL L POINTER AT L+5 .S41.1 WILL RETURN WITH
R2570           POINTER AT L (L MUST BE LESS THAN OR = TO 140)
R2571  OUTPUT
R2572           MPAC CONTAINS VG IN CONTROL COORDS          VECT. B7M/CS
R2573  DEBRIS:
R2574         QTEMP    TEMP ERASABLE
R2575         QPRET
 2576  REF   1                                        COUNT  22/S41.1

 2577  REF   1                 22,2000                SETLOC P40S5
 2578                          22,3426                BANK

 2579                          22,3426   45020 1 S41.1 STQ    CALL
 2580  REF  14  LAST  665     22,3427   03657 0       QTEMP
 2581  REF   5  LAST  583     22,3430   47432 1       CDUTRIG
 2582                          22,3431   77775 1       VLOAD
 2583                          22,3432   45121 1       MXV    CALL
 2584  REF  19  LAST  667     22,3433   01736 1       REFSMMAT
 2585  REF   3  LAST  583     22,3434   47577 1       *SMNB*
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2586                          22,3435  74321 1          MXV    VXSC
2587  REF  2  LAST  403       22,3436  05004 C                 QUADRCT
2588  REF  1                  22,3437  05443 1                 TENBNK14    VG IN CONTROL COORD IN MPAC SCALED AT
2589                          22,3440  52072 C          VSL5   GOTO        VG IN CONTROL COORDS. IN MPAC AT 2(+7)
2590  REF  15  LAST  67C      22,3441  03657 C                 QTEMP
2591                          22,3442  24000 1  TENBNK14 2DEC  10. B-4
2591                          22,3443  00000 1
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R2592   NAME          S40.8 - CROSS PRODUCT STEERING
R2593   FUNCTION      (1) UPDATES THE VELOCITY-TO-BE-GAINED VECTOR.
R2594                 (2) GENERATES ANGULAR RATE STEERING COMMANDS FOR AUTOPILOT.
R2595                 (3) ESTABLISHES ENGINE CUT-OFF SIGNALS AT APPROPRIATE TIMES.
R25952                (4) INITIATES THRUST-FAIL ROUTINE, R40
R2596   CALLING SEQ   CALL S40.8
R2597   INPUT         VGPREV  - LAST VALUE OF THE VELOCITY-TO-BE-GAINED VECTOR
R2598                           PRIOR TO UPDATING IN METERS/CS AT +7.
R2599                 DELVREF - CHANGE IN VEHICLE VELOCITY SINCE LAST MEASUREMENT
R2600                           IN METERS/CS AT +7.
R2601                 BDT     - EFFECT OF RATE OF CHANGE OF REQUIRED VELOCITY AND
R2602                           GRAVITY DURING DT UPON VELOCITY-TO-BE-GAINED IN
R2603                           METERS/CS AT +7.
R2604                 CSTEER  - A SCALAR OF THE STEERING LAW, SC.AT B+1, USED FOR
R2605                           SPS AIMPOINT STEERING MANEUVERS
R2606                 IDLEFAIL- A FLAG TO INHIBIT (IDLE) THE THRUST-FAIL ROUTINE
R2607                 STEERSW - A SWITCH TO PRECLUDE NEEDLESS CONDUCT OF STEERING
R2608                 REFSMMAT, DAPDATR1, PIPTIME
R2609                 EREPFRAC, ETDECAY, KPRIMECT FOR TVC
R2614   OUTPUT        TTOGO   - TIME REMAINING FOR ENGINE BURN IN CS AT +28
R2615                 OMEGAC  - DP VECTOR RATE COMMAND, SC.AT  1/(2TVCDT) REVS/SEC
R26152                VG, VGPREV, VGDISP, TGO, TIG, SCALED AS NOTED IN CODING
R26153                STEERSW, IMPULSW, NVWORD1
R26154                REPFRAC, CNTR, VCNTR, VCNTRTMP FOR TVC (R40 INTERFACING)
R2616   DEBRIS        OMEGAXC,+1
R2617   SUBROUTINES USED  - *SMNB* , ALARM

 2618   REF   2  LAST  663   16,2000                        SETLOC  P40S1
 2619                        16,2130                        BANK
 2620   REF  50  LAST  661   E6,1466                        EBANK=  DAPDATR1
 2621   REF   1                                            COUNT   16/S40.8

 2622                        16,2130   44001 C  S40.8       SETPD   STQ
 2623                        16,2131   00001 C  SPBIT1              OOD
 2624   REF  16  LAST  671   16,2132   03657 C                      QTEMP
 2625                        16,2133   51375 1              VLOAD   BVSU          CONSTRUCT DELVG, SC.AT B+7  M/CS
 2626   REF   3  LAST  652   16,2134   03433 C                      DELVREF
 2627   REF   4  LAST  663   16,2135   03705 C                      BDT
 2628                        16,2136   77655 1              VAD
 2629   REF   3  LAST  653   16,2137   03721 C                      VGPREV
 2630   REF   3  LAST  121   16,2140   03460 C              STORE   VG            VELOCITY-TO-BE-GAINED, SC.AT B+7  M/CS

 2631                        16,2141   77646 C              ABVAL
 2632   REF   7  LAST  638   16,2142   03654 C              STORE   VGDISP        FOR DISPLAY PURPOSES
 2633                        16,2143   77776 1              EXIT
 2634   REF  58  LAST  661   16,2144  0 5301 C              TC      PHASCHNG
 2635                        16,2145   10035 C              OCT     10035         TYPE B  RESTART BELOW AND 5.3 REREADAC

 2636   REF 145  LAST  657   16,2146  0 6006 1              TC      INTPRET
 2637                        16,2147   77775 1              VLOAD
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2638   REF   4  LAST  672   16,2150   03460 C                VG
2639   REF   4  LAST  672   16,2151   03721 C          STORE VGPREV
2640                        16,2152   77214 C          BOFF  VLOAD
2641   REF   2  LAST  66C   16,2153   01344 C                STEERSW    SKIP TGO AND CROSS-PRODUCT
2642   REF  17  LAST  672   16,2154   03657 C                QTEMP
2643   REF   4  LAST  672   16,2155   03433 C                DELVREF
2644                        16,2156   41446 1          ABVAL PUSH       CHECK FOR LOTHRUST
2645                        16,2157   41335 1          SLOAD DMP
26453  REF   1              16,2160   01354 1                DVTHRESH   SC.AT B-2 M/CS
26454  REF   1              16,2161   36011 1                DPB-9
26456                       16,2162   77621 1          BDSU
2646                        16,2163   77440 1          BMN   EXIT
2647   REF   1              16,2164   40021 C                LOTHRUST
2648   REF  51  LAST  672   16,2165  31'466 1          CAE   DAPDATR1    ENABLE TVCDAP CG TRACKING
2649   REF  39  LAST  582   16,2166  7 4675 C          MASK  BIT14
2650   REF 153  LAST  659   16,2167  10 000 C          CCS   A
2651   REF  48  LAST  661   16,2170  3 4712 1          CAF   BIT1
2652   REF 154  LAST  673   16,2171  50 000 1          INDEX A          LM-OFF, LM-ON VALUE
2653   REF   1              16,2172  31'423 C          CAE   EREPFRAC
2654   REF   2  LAST  102   16,2173  55'652 C          TS    REPFRAC

2655   REF 146  LAST  672   16,2174  0 6006 1          TC    INTPRET
2656                        16,2175   51375 1 TGOCALC  VLOAD BVSU       GET DELVG
2657   REF   5  LAST  673   16,2176   03433 C                DELVREF
2658   REF   5  LAST  672   16,2177   03705 C                BDT
2659                        16,2200   77656 1          UNIT
2660                        16,2201   41441 C          DOT   PUSH       (OOD)
2661   REF   5  LAST  673   16,2202   03460 C                VG
2662                        16,2203   56244 C          BPL   DDV        ANGLE SHOULD BE GREATER THAN PI/2
2663   REF   1              16,2204   40013 1                INCRSVG          DISPLAY ALARM IF NOT
2664   REF   1              16,2205   36005 1                2VEXHUST
2665                        16,2206   41215 1          DAD   DMP        (DOT PRODUCT UP FROM OOD)
2666   REF   1              16,2207   11451 1                LODPHALF
2667                        16,2210   70501 1          NORM  SR1
2668   REF  29  LAST  653   16,2211   00047 1                X1
2669                        16,2212   60325 C          PDDL  NORM
2670                        16,2213   00045 C                36D        (MAG DELVG)
2671   REF  11  LAST  591   16,2214   00050 1                X2
2672                        16,2215   77665 1          BDDV
2673                        16,2216   53664 C          XSU,2 SL*
2674   REF  30  LAST  673   16,2217   00046 C                X1
2675                        16,2220   57607 1                0 -90,2
2676                        16,2221   41405 C          DMP   PUSH       (OOD)
2677   REF   1              16,2222   36003 1                -FOURDT
2678                        16,2223   54335 C          SLOAD SR
2679   REF   1              16,2224   03016 C                ETDECAY    ETDECAY SC.AT B+14 CS
2680                        16,2225   20617 C                14D
2681                        16,2226   45421 1          BDSU  STADR
2682   REF  15  LAST  662   16,2227   74347 1          STORE TGO        TIME TO GO IN CS. AT +28
2683                        16,2230   77615 C          DAD
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2684  REF   7  LAST  653   16,2231   01205 1                PIPTIME
2685  REF  64  LAST  664   16,2232   17413 1          STODL TIG
2686  REF  16  LAST  673   16,2233   03430 C                TGO
2687                        16,2234   50025 C          DSU   BMN
2688  REF   1               16,2235   36007 C                FOURSEC
2689  REF   1               16,2236   40000 C                S40.81

2690                        16,2237   74375 C  XPRODUCT VLOAD VXSC
2691  REF   6  LAST  673    16,2240   03705 C                BDT
2692  REF   6  LAST  666    16,2241   03703 C                CSTEER
2693                        16,2242   52352 1          VSL2  VSU
2694  REF   6  LAST  673    16,2243   03433 C                DELVREF
2695                        16,2244   63256 C          UNIT  PDVL
2696  REF   6  LAST  673    16,2245   03460 C                VG
2697                        16,2246   47256 C          UNIT  VXV
2698                        16,2247   45121 1          MXV   CALL
2699  REF  20  LAST  670    16,2250   01736 1                REFSMMAT        (REFSMMAT/2)
2700  REF   4  LAST  670    16,2251   47577 1                *SMNB*
2701                        16,2252   77761 1          VXSC
2702  REF   2  LAST  102    16,2253   03245 1                KPRIMEDT        (KPRIMEDT SCIAT PI/8 RAD)
2703  REF   5  LAST  100    16,2254   03126 1  OMEGACLC STORE OMEGAC
2704                        16,2255   77650 1          GOTO
2705  REF  18  LAST  673    16,2256   03657 C                QTEMP

2706  REF   1               17,2000                    SETLOC DAPS7
2707                        17,2000                    BANK
2708  REF   1                                          COUNT  17/S40.8

2709                        17,2000   00000 1  TWODT   2DEC   200.0 B-28     2 SEC
2709                        17,2001   00310 0
2710                        17,2002   77715 1  -FOURDT 2DEC   -800 B-18      -4(200CS), SC.AT B+18CS (-4 FOR SCALING)
2710                        17,2003   77777 0
2711                        17,2004   17602 0  2VEXHUST 2DEC  63.020792 B-7  2(10338.0564 FPS), SC.AT B+7 M/CS
2711                        17,2005   25124 1
2712                        17,2006   00000 1  FOURSEC 2DEC   400.0  B-28    4 SEC
2712                        17,2007   00620 0
2713                        17,2010   00040 0  DPB-9   2DEC   1 B-9
2713                        17,2011   00000 1
2714  REF   1               20,2000                    SETLOC DAPS6
2715                        20,2000                    BANK

2716  REF   1                                          COUNT  20/S40.8

2717                        20,2000   77214 0  S40.81  SET    VLOAD           TGO LESS THAN 4 SECONDS
2718  REF   3  LAST  654    20,2001   01066 0                 IMPULSW         FOR ENGINE-OFF CALL
2719  REF  20  LAST  66E    20,2002   15332 1                 HI6ZEROS
2720  REF   6  LAST  674    20,2003   03126 1  RATEZRO STORE  OMEGAC          TVC TO ATTITUDE HOLD
2721                        20,2004   77776 1          EXIT
2722  REF  15  LAST  649    20,2005   3 4672 0         CAF    POSMAX          INHIBIT SWITCHOVER/TVC EG TRACKING
2723  REF   3  LAST  661    20,2006   55'447 0         TS     CNTR
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2724  REF 147  LAST 673  20,2007  0 6006 1          TC      INTPRET
2725                     20,2010   52014 C          CLEAR   GOTO
2726  REF   3  LAST 673  20,2011   01264 C                  STEERSW     RESTARTS OK
2727  REF  19  LAST 674  20,2012   03657 C                  QTEMP
2728                     20,2013   77776 1  INCRSVG EXIT               ALARM INDICATING THAT THRUST IS POINTING
2729  REF  26  LAST 545  20,2014   0 5537 C          TC      ALARM       IN WRONG DIRECTION.
2730                     20,2015   01407 C          OCT     01407
2731  REF 148  LAST 675  20,2016   0 6006 1          TC      INTPRET
2732                     20,2017   77650 1          GOTO
2733  REF  20  LAST 675  20,2020   03657 C                  QTEMP

2734                     20,2021   77214 C  LOTHRUST BON     VLOAD       THRUST FAILURE (LO-OR-NO) INDICATED
2735  REF   3  LAST 661  20,2022   00711 C                  IDLEFAIL    SET BY V97P. ALLOWS 1 BYPASS IN CASE OF
2736  REF  21  LAST 675  20,2023   03657 C                  QTEMP           UNFAVORABLE S40.8 SYNCH
2737  REF  21  LAST 674  20,2024   15332 1                  HI6ZEROS    START OF ENGINE-FAIL (R40) OPERATIONS
2738  REF   7  LAST 674  20,2025   03126 1          STORE   OMEGAC      PUT TVC IN ATTITUDE HOLD
2739                     20,2026   77776 1          EXIT

2740  REF 133  LAST 660  20,2027   4 4714 C         CS      ZERO
2741  REF   3  LAST 660  20,2030   55'653 1         TS      VCNTR       KILL CSMMASS UPDATING
2742  REF   2  LAST 102  20,2031   55'663 1         TS      VCNTRTMP    (TVCEXEC LOGIC REQUIRES THIS TOO)
2743  REF   3  LAST 673  20,2032   55'652 C         TS      REPFRAC     KILL TVCDAP CG TRIM TRACKING
2744  REF  19  LAST 662  20,2033   55'145 1         TS      NVWORD1     SET UP ENGINE-FAIL V97FLASH (CLOCKJ08)

2745  REF 149  LAST 675  20,2034   0 6006 1         TC      INTPRET
2746                     20,2035   52014 C          CLEAR   GOTO        INHIBIT STEERING AND TGO CALC (MANUAL
2747  REF   4  LAST 675  20,2036   01264 C                  STEERSW         SHUTDOWN IF NOT SET UP AGAIN)
2748  REF  22  LAST 675  20,2037   03657 C                  QTEMP       RESTARTS OK
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P2749   NAME        S40.9 - VTOGAIN (AIMPOINT MANEUVERS ONLY)
R2750   FUNCTION    (1) GENERATES REQUIRED VELOCITY AND VELOCITY-TO-BE-GAINED
R2751               VECTORS FOR USE DURING AIMPOINT MANEUVERS
R2752               (2) UPDATES THE B VECTOR WHICH IS USED IN THE FINAL
R2753               CALCULATION OF EXTRAPOLATING THE VELOCITY-TO-BE-GAINED
R2754   CALLING SEQ VIA FINDVAC AS NEW JOB.
R2755   INPUT       RNIT      - ACTIVE VEHICLE RADIUS VECTOR IN METERS AT +29.
R2756               VNIT      - ACTIVE VEHICLE VELOCITY VECTOR IN METERS/CS AT +7
R2757               VRPREV    - LAST COMPUTED VELOCITY REQUIRED VECTOR IN
R2758                           METERS/CS AT +7.
R2759               NOMTIG    - TIME OF IGN. USED IN TARGETTING ROUTINES%+28"
R2760               DELLT4    - TRANSFER TIME FROM PIPTIME TO TARGET%+28"
R2761               TNIT      - TIME OF RNIT AND VNIT IN CS AT +28
R2762               GDT/2     - HALF OF VELOCITY GAINED IN DELTA T TIME DUE TO
R2763                           ACCERERATION OF GRAVITY IN METERS/CS AT +7.
R2764               DELVREF   - CHANGE IN VELOCITY DURING LAST 2 SEC IN
R2765                           METERS/CS AT +7.
R2766           NORMSW    SET=CENTRAL ANGLE BETWEEN RTARG AND RTIG IS BETWEEN
R2767                     165 TO 195 DEGREES
R2768                     RESET=CENTRAL ANGLE OUTSIDE CONE DESCRIBED ABOVE
R2769   OUTPUT      VGTEMP    - VELOCITY TO BE GAINED VECTOR IN METERS/CS AT +7.
R2770               COGA      - INPUT OF INITIAL GUESS FOR LAMBERT FROM S40.1 O
R2771                           OR PREVICUS PASS THRU S40.9
R2772               GOBL/2    -OBLATENESS TERM IN AVG GRAV CALC-GOBL*RSQ/MU
R2773               VRPREV    - VELOCITY REQUIRED VECTOR IN METERS/CS AT +7.
R2774               BDT       - B VECTOR IN METERS/CS AT +7.
R2775   SUBROUTINES USED -  INITVEL
 2776   REF   3 LAST 672   16,2000                          SETLOC P40S1
 2777                       16,2257                          BANK

 2778   REF   7 LAST 654   E6,1746                          EBANK= NBRCYCLS
 2779   REF   1                                             COUNT  16/S40.9

 2780   REF 150 LAST 679   16,2257   0 6006 1   S40.9      TC     INTPRET
 2781                       16,2260    71201 1             SETPD  DLOAD
 2782                       16,2261    00001 0                    00D
 2783   REF   2 LAST 663   16,2262    11453 0                    LOSZERCS
 2784                       16,2263    77725 1             PDDL
 2785   REF   1             16,2264    34401 0                    EP4(45)L
 2786                       16,2265    71214 0             BON    DLOAD
 2787   REF   5 LAST 665   16,2266    03705 0                    NORMSW
 2788                       16,2267    34271 1                    +2
 2789   REF   1             16,2270    34403 1                    EP4(10)L
 2790                       16,2271    77606 1             PUSH
 2793                       16,2272    45014 0             CLEAR  CALL
 2794   REF   3 LAST 479   16,2273    00675 0                    GUESSW
 2795   REF   1             16,2274    22002 0                    HAVEGUES
27951                       16,2275    77776 1             EXIT
27952   REF  55 LAST 672   16,2276   0 5301 0             TC     PHASCHNG     SAVE TIME BY NOT REDOING LAMBERT CALCS
27953                       16,2277    05021 1             OCT    05021        0, PRIORITY NEXT, JOB BELOW
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27954                          16,2300   10000 C            OCT     10000
27955  REF 151 LAST 676        16,2301   0 6006 1           TC      INTPRET
2796                           16,2302   77614 1  ENDLAMB   BON
2797   REF   3 LAST 663        16,2303   01310 1                    FIRSTFLG
2798   REF   1                 16,2304   34322 C                    FIRSTTME
2799                           16,2305   52375 1            VLOAD   VSU
2800   REF  15 LAST 666        16,2306   03612 1                    VIPRIME
2801   REF   2 LAST 119        16,2307   03466 C                    VRPREV
2802                           16,2310   45325 1            PDDL    DSU
2803   REF   3 LAST 653        16,2311   03474 C                    TNIT
2804   REF   2 LAST 119        16,2312   03476 1                    TNITPREV
2805                           16,2313   55261 1            SL      BDDV
2806                           16,2314   20222 1                    17D
2807   REF   1                 16,2315   34375 1                    200C SHI
2808                           16,2316   77761 1            VXSC
2809                           16,2317   76451 C            VSU     VSL1
2810   REF   2 LAST  76        16,2320   01207 C                    GDT/2
2811   REF   7 LAST 674        16,2321   03705 C            STORE   BDT
2812                           16,2322   57535 C  FIRSTTME  SLOAD   DCOMP
2813   REF  13 LAST 665        16,2323   03747 C                    RTX2
28131                          16,2324   77640 C            BMN
2814   REF   1                 16,2325   34342 C                    MOONCASE
2815                           16,2326   53575 C            VLOAD   UNIT
2816   REF  10 LAST 653        16,2327   01171 1                    RN
2817                           16,2330   45345 1            DLOAD   DSU
2818   REF   8 LAST 674        16,2331   01205 1                    PIPTIME
2819   REF   3 LAST 637        16,2332   03450 C                    NOMTIG
2820                           16,2333   56205 C            DMP     DDV
2821   REF   1                 16,2334   34377 C                    EARTHMU
2822                           16,2335   00043 C                    34D
2823                           16,2336   53361 C            VXSC    VAD
2824   REF   2 LAST  76        16,2337   01215 C                    GOBL/2
2825   REF   2 LAST 653        16,2340   03646 C                    VGTEMP      NOTE  NO TEST IS MADE TO SUBTRACT GOBL
2826   REF   3 LAST 677        16,2341   03646 C            STORE   VGTEMP      INSIDE 165-195 DEGREE CONE AREA.
2827                           16,2342   77776 1  MOONCASE  EXIT
2828   REF  60 LAST 676        16,2343   0 5301 C           TC      PHASCHNG
2829                           16,2344   04021 C            OCT     04021       C, JOB BELOW

2830   REF 152 LAST 677        16,2345   0 6006 1  COPY40.9  TC      INTPRET
2831                           16,2346   77745 1            DLOAD
2832   REF   4 LAST 677        16,2347   03474 C                    TNIT
2833   REF   3 LAST 677        16,2350   27476 1            STOVL   TNITPREV
2834   REF  16 LAST 677        16,2351   03612 1                    VIPRIME
2835   REF   3 LAST 677        16,2352   03466 C            STORE   VRPREV
2836                           16,2353   77414 C            CLEAR   EXIT
2837   REF   4 LAST 677        16,2354   01270 C                    FIRSTFLG
2838   REF  81 LAST 654        16,2355   4 4712 C    -2     CS      ONE         REDO40.9 (RESTART)  ENTRY TO END  S40.9
2839   REF   8 LAST 676        16,2356   55'746 1           TS      NBRCYCLS
2840   REF  61 LAST 677        16,2357   0 5301 C  ENDS40.9 TC      PHASCHNG
2841                           16,2360   00001 C            OCT     00001
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2842   REF  88  LAST  661   16,2361  1 5112 1            TCF     ENDOFJOB

28421  REF 193  LAST  677   16,2362  0 6006 1  REDO40.9  TC      INTPRET         S40.9 RESTARTS COME HERE TO GRACEFULLY
28422                       16,2363   77775 1            VLOAD                       TERMINATE S40.9 SO THAT IT CAN BE
28423  REF   3  LAST  676   16,2364   11453 0                    LOCZEROS            SET UP WITH LATEST R,V,T NEXT PASS
28424  REF   6  LAST  653   16,2365   17351 0            STODL   DELVSUM             (TYPE C PHASE POINTS '04021' WILL
28425  REF   4  LAST  678   16,2366   11453 0                    LOCZEROS            FORCE NORMAL S40.9 TERMINATIONS,
28426  REF   9  LAST  677   16,2367   27347 1            STOVL   NBRCYCLS            RATHER THAN LOSE TIME OF BRAND NEW
284262 REF   5  LAST  673   16,2370   03721 0                    VGPREV              PASS -- QUICK OLD DATA BETTER THAN
284264 REF   4  LAST  677   16,2371   03646 0            STORE   VGTEMP              NONE) NOW CAN GO THRU SETUP.9
28427                       16,2372   77776 1            EXIT                        WITHOUT DISTURBING VGPREV
28428  REF   1              16,2373  1 2355 1            TCF     ENDS40.9 -2     STORE 0,0 COVERED NBRCYCLS,P -- FIX UP S

2843                        16,2374   01440 0  200CSHI   2DEC    200 B-12
2843                        16,2375   00000 1
2844                        16,2376   55340 0  EARTHMU   2DEC*   -3.986032 E10 B-36*
2844                        16,2377   61710 0
2845                        16,2400   04000 0  EP4(45)L  2DEC    .125
2845                        16,2401   00000 1
2846                        16,2402   00707 1  EP4(10)L  2DEC    .027777777
2846                        16,2403   03434 1
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P2847   NAME          S4C.13 - TIMEBURN
R2848   FUNCTION      (1) DETERMINE WHETHER A GIVEN COMBINATION OF VELOCITY-TO-
R2849                 BE-GAINED AND ENGINE CHOICE RESULT IN A BURN TIME SUFFICIENT
R2850                 TO ALLOW STEERING AT THE VEHICLE DURING THE BURN, AND
R2851                 (2) THE MAGNITUDE OF RESULTING BURN TIME - IF IT IS SHORT -
R2852                 AND THE ASSOCIATED TIME OF THE ENGINE-OFF SIGNAL.
R2853   CALLING SEQ   VIA FINDVAC AS NEW JOB.
R2854   INPUT         VGTIG - VELOCITY TO BE GAINED VECTOR (METERS/C.S.) AT +7
R2855              WEIGHT/G - MASS OF VEHICLE IN KGM AT TIG
R2856                 F - ENGINE THRUST IN M.NEWTONS AT +7
R2857                 MDOT - RATE OF DECREASE OF VEHICLE MASS DURING ENGINE BURN
R2858                        IN KILOGRAMS/CENTISECOND AT +3.  THIS SCALING MAY
R2859                        REQUIRE MODIFICATION FOR SATURN BURNS.
R2860   OUTPUT        IMPULSW - ZERO FOR STEERING
R2861                         - ONE FOR ATTITUDE HOLD
R2862                 TGO - TIME TO BURN IN CENTISECONDS AT +14
R2863     THE QUANTITY M.NEWTON SHALL BE USED TO EXPRESS WEIGHT IN TERMS OF
R2864     (KILOGRAM*METER)/(CENTISECOND*CENTISECOND)
R2865     (1) M.NEWTON = (10000) NEWTONS
 2866   REF  17  LAST  674    E7,1427                          EBANK= TGO
 2867   REF   1                                               COUNT  16/40.13

 2868   REF 154  LAST  678    16,2404  0 6006 1  S40.13   TC      INTPRET
 2869                         16,2405   43001 1             SETPD   SET
 2870                         16,2406   00001 0             0OD
 2871   REF   4  LAST  674    16,2407   01066 0             IMPULSW         ASSUME NO STEERING UNTIL FOUND OTHERWISE
 2872                         16,2410   51575 1      VLOAD  ABVAL
 2873   REF  12  LAST  666    16,2411   03721 0             VGTIG           VELOCITY TO BE GAINED AT +7
 2874                         16,2412   77776 1      EXIT
 2875   REF  35  LAST  651    16,2413  3 4704 0      CAF    BIT7            TEST +X TRANSLATION
 2876                         16,2414  0 0006 1      EXTEND
 2877   REF   4  LAST  581    16,2415  06 031 0      RXOR   CHAN31
 2878   REF  36  LAST  679    16,2416  7 4704 1      MASK   BIT7
 2879                         16,2417  0 0006 1      EXTEND
 2880   REF   1               16,2420  1 2502 0      BZF    NOTADDUL
 2881   REF 155  LAST  679    16,2421  0 6006 1      TC     INTPRET
 2882                         16,2422   56325 0      PDDL   DDV             0OD = MAG OF VGTIG AT +7
 2883   REF   1               16,2423   36027 1             S40.135         COMPENSATION FOR 2 JET ULLAGE AT +24
 2884   REF   4  LAST  666    16,2424   03076 0             WEIGHT/G        MASS IN KGMS AT +16
 2885                         16,2425   72414 0      BON    SL1             DOUBLE CORRECTION IF FOUR JETS
 2886   REF   2  LAST  641    16,2426   00700 0             NJETSFLG
 2887   REF   1               16,2427   34430 1             S40.130
 2888                         16,2430   77621 1  S40.130    BDSU
 2889                         16,2431   56325 0      PDDL   DDV             0OD = MAG OF VGTIG CORRECTED FOR ULLAGE
 2890   REF   1               16,2432   36013 0             K1VAL           M.NETWON-CS AT +24
 2891   REF   5  LAST  679    16,2433   03076 0             WEIGHT/G
 2892                         16,2434   50021 1      BDSU   BMN
 2893                         16,2435   00001 0             0OD
 2894   REF   1               16,2436   34461 0             S40.131         TGO LESS THAN 100 CS
 2895                         16,2437   41325 0      PDDL   DMP             02D = TEMP1 AT +7
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2896  REF   1                 16,2440  36031 C                 MDOTLC    MDOT, SC.AT B+3 KG/CS
2900  REF   1                 16,2441  36023 C                 3.5SEC    350 CS AT +14
2901                          16,2442  65221 C           BDSU  PDDL
2902  REF   6  LAST  679       16,2443  03076 C                 WEIGHT/G
2903  REF   5  LAST  666       16,2444  03727 C                 F         F AT +7
2904                          16,2445  60405 C           DMP   SR2
2905  REF   1                 16,2446  36025 C                 5SECCND   500 CS AT +14
2906                          16,2447  41471 C           DDV   PUSH      04D = TEMP2
2907                          16,2450  51021 C           BDSU  BPL
2908                          16,2451  00003 1                 02D
2909  REF   1                 16,2452  34475 C                 S40.133   TGO GREATER THAN 600 CS
2910                          16,2453  55345 C           DLOAD BDDV
2911                          16,2454  43205 1           DMP   DAD
2912  REF   2  LAST  68C       16,2455  36025 C                 5SECCND   500 CS AT +14
2913  REF   1                 16,2456  36021 1                 1SEC2D    100 CS AT +14
2914                          16,2457  77650 1           GOTO
2915  REF   1                 16,2460  34466 1                 S40.132
2916                          16,2461  41345 C  S40.131  DLOAD   DMP       TGO LESS THAN 100 CS
2917  REF   7  LAST  68C       16,2462  03076 C                 WEIGHT/G
2918                          16,2463  56215 1           DAD   DDV
2919  REF   1                 16,2464  36015 C                 K2VAL     M.NEWTON-CS AT +24
2920  REF   1                 16,2465  36017 1                 K3VAL     M.NEWTONS AT +10
2921                          16,2466  77776 1  S40.132  EXIT
2922  REF  18  LAST  679       E7,1427                 EBANK=  TGO
2923  REF   7  LAST  345       16,2467  0 7226 C                TPAGREE
2924  REF 271  LAST  654       16,2470  3 0154 1                MPAC
2925  REF  67  LAST  654       16,2471  56 001 C                L
2926  REF 134  LAST  679       16,2472  3 4714 1                ZERO
2927  REF  19  LAST  68C       16,2473  53'430 C               DXCH      TGO       TGO IN CS AT +28
2928  REF   1                 16,2474  0 2477 1                TC        S40.134
2929                          16,2475   77414 C  S40.133  CLEAR   EXIT      WILL STEER VEHICLE
2930  REF   5  LAST  679       16,2476   01266 1                 IMPULSW
2931  REF  62  LAST  677       16,2477  0 5301 C  S40.134  TC      PHASCHNG  KILL GROUP 3
2932                          16,2500   00003 1                 OCT       3

2933  REF  89  LAST  678       16,2501  1 5112 1                TCF       ENDOFJOB


2934  REF 156  LAST  679       16,2502  0 6006 1  NOTACDUL TC     INTPRET
2935                          16,2503   77650 1           GOTO
2936  REF   2  LAST  679       16,2504   34431 C                 S40.130 +1    DO NOT COMPENSATE FOR 7 SEC OF ULLAGE
2937  REF   2  LAST  674       17,2000                 SETLOC  DAPS7
2938                          17,2012                 BANK

2939  REF   1                                         COUNT   17/40.13

2940                          17,2012   00001 C  K1VAL    2DEC    884.52887 B-23  19885 LB-SEC, SC.AT B+23 NEWTON-SEC/E+2
2940                          17,2013   27221 C
2941                          17,2014   00000 1  K2VAL    2DEC    293.137805 B-23  6590 LB-SEC, SC.AT B+23 NEWTON-SEC/E+2
2941                          17,2015   22244 C
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 2942                 17,2016   00570 0  K3VAL    2DEC   11.7766668 B-9   26475 LBS, SC.AT B+9 NEWTONS/E+4
 2942                 17,2017   33235 0
 2943                 17,2020   00144 0  1SEC2D   2DEC   100.0 B-14       100.0 CS AT +14
 2943                 17,2021   00000 1
 2944                 17,2022   01274 1  3.5SEC   2DEC   350.0 B-13       350.0 CS AT +13
 2944                 17,2023   00000 1
 2945                 17,2024   00764 1  5SECOND  2DEC   500.0 B-14       500 CS AT +14
 2945                 17,2025   00000 1
 2946                 17,2026   00000 1  S40.135  2DEC   69.6005183 B-23  IMPULSE FROM 7.96 SECS OF 2-JET FIRING
 2946                 17,2027   04263 1
A2946C2                                                                   7.96(199.6)COS(10)  LB-SEC,  SC.AT
A2946C3                                                                   B+23 NEWTON-SEC/E+2  (7 SEC ULLAGE
A2946C4                                                                   TO GO, PLUS 0.96 SEC FROM PIPTIME)
 29462                17,2030   01120 0  MDOTLO   2DEC   .289391932 B-3   63.8 LB/SEC, SC.AT B+3 KG/CS   (=MDOTH1)
 29462                17,2031   25456 1
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P2947   NAME     S40.6  GIMBAL DRIVE TEST AND/OR GIMBAL TRIM
R2948   MOD NO 5                        DATE 9 MARCH, 1967
R2949   MOD BY   ENGEL                  LOG SECTION P40-P47
R2950   FUNCTIONAL DESCRIPTION
R2951        GIMBAL DRIVE TEST....0,+2,-2,0  DEGREE ENGINE COMMANDS, AT 2 SECOND
R2952             INTERVALS, FIRST IN PITCH, THEN IN YAW. ASTRONAUT VERIFICATION
R2953             OF GIMBAL MOTION ON GPI
R2954        GIMBAL TRIM....AFTER A 4 SECOND DELAY,ENGINE COMMANDED TO
R2955             PRE-COMPUTED TRIM POSITION. ASTRONAUT VERIFICATION ON GPI.
R2956        PRE40.6....RESTART ENTRY TO RE-DO S40.6, ONLY IF RCS IS ON - IF TVC
R2957              IS NOT ON - PRIMARILY TO GET ACTUATORS TRIMMED FOR IGNITION.
R2958              BYPASS 4 SEC DELAY.  SPEED IS CRITICAL NEAR IGNITION.
R2959              IF TVC IS ON (TVCDAPON OR LATER)  THEN REDOTVC WILL TAKE CARE
R2960              OF RESTARTING ACTUATORS.
R2961   CALLING SEQUENCE....
R2962        WAITLIST,  WITH 2CADR FOR S40.6 (OR PRE40.6),  WITH EBANK= CNTR
R2963   NORMAL EXIT MODE - FIXDELAY, TASKOVER
R2964   SUBROUTINES CALLED....
R2965        OUTPUT (INTERNAL)
R2966        FIXDELAY
R2967   ALARM OR ABORT EXIT MODES - NONE
R2968   ERASEABLE INITIALIZATION REQUIRED
R2969        CNTR = +0,  NORMALLY SET BY THE P40 CALL AT TST,TRIM
R2970        MRKRTMP...POSITIVE FOR GIMBAL DRIVE TEST AND GIMBAL TRIM (BOTH)
R2971                  NEGATIVE FOR GIMBAL TRIM ONLY
R2972        FACTOFF, YACTOFF SC.AT 85.41 ARCSEC/BIT  (V48N48 P,YTRIM)
R2973        ..SC CONT.. SWITCH AT ..CMC.. (A/P CONTROL SWITCH AT ..GNC..)
R2974        ACTIVE SPS GIMBAL MOTOR POWER(S),  PITCH, YAW
R2975   OUTPUT
R2976        TVCYAW, TVCPITCH (BITS RELEASED)
R2977        TVC ENABLE  AND  OPTICS ERROR COUNTER ENABLE
R2978   ERASE
R2979        TEMPR60, CNTR
R2980
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2981                          17,2032                    BANK   17
2982   REF   2  LAST  674    20,2000                    SETLOC DAPS6
2983                          20,2040                    BANK

2984   REF   4  LAST  674    E6,1447                    EBANK= CNTR
2985   REF   1                                          COUNT  20/S40.6

2986   REF  21  LAST  65C    20,2040  30 102 1  PRE40.6 CAE    FLAGWRD6      RESTART ENTRY TO S40.6.  CHECK T5 BITS.
2987   REF  10  LAST  649    20,2041  7 4105 0          MASK   OCT60000
2988                          20,2042  0 0006 1          EXTEND
2989   REF  38  LAST  662    20,2043  6 5213 1          BZMF   TASKOVER      NOT RCS  (BITS NOT 01),  DONT DO S40.6

2990   REF  49  LAST  673    20,2044  4 4712 0          CS     BIT1          RCS, SO DO S40.6,  GIMTRIM ONLY
2991   REF   3  LAST  638    20,2045  55'445 1          TS     MRKRTMP
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 2992   REF   5C  LAST  682   20,2046  3 4712 1          CAF     BIT1      FOR REVISED S40.6 TIMING FOR RESTARTS...
 2993   REF    5  LAST  682   20,2047  55'447 C          TS      CNTR      TO INDICATE A RESTART ENTRY (CNTR IS
A2994                                                                       NORMALLY +0, BY S40.6)


29945   REF    6  LAST  683   E6,1447                    EBANK=  CNTR
 2995   REF  135  LAST  680   20,2050  4 4714 C  S40.6   CS      ZERO      INHIBIT OPTICS ACTIVITY
 2996   REF   24  LAST  652   20,2051  55'303 1          TS      OPTIND

 2997   REF   27  LAST  644   20,2052  4 4711 C          CS      BIT2      DISENABLE OPTICS ERROR COUNTERS (ZERO,
 2998                        20,2053  0 0006 1          EXTEND              AND INHIBIT PULSE TRANSMISSION -
 2999   REF   27  LAST  652   20,2054  03 012 1          WAND    CHAN12      NORMAL STATE)

 3000   REF    1              20,2055  3 2142 1          CAF     OCT02200  TVC ENABLE (SPS SERVO AMPS SEE DAC
 3001                        20,2056  0 0006 1          EXTEND              VOLTAGES) AND DISENGAGE OPTICS/DAC
 3002   REF   28  LAST  683   20,2057  05 012 1          WOR     CHAN12

 3003   REF    8  LAST  662   20,2060  0 5156 C          TC      FIXDELAY  60MS PROCEDURAL DELAY (40MS MINIMUM) FOR
 3004                        20,2061   00006 1          DEC     6           RELAY LATCHING

 3005   REF   28  LAST  683   20,2062  3 4711 1          CAF     BIT2      ENABLE OPTICS ERROR COUNTERS
 3006                        20,2063  0 0006 1          EXTEND
 3007   REF   29  LAST  683   20,2064  05 012 1          WOR     CHAN12

 3008   REF    9  LAST  683   20,2065  0 5156 C          TC      FIXDELAY  20MS PROCEDURAL DELAY (4MS MINIMUM) FOR
 3009                        20,2066   00002 C          DEC     2           RELAY LATCHING

 3010   REF    7  LAST  683   20,2067  11'447 C  RSTRTST  CCS     CNTR      CHECK FOR RESTART ENTRY (PRE40.6)
 3011   REF    1              20,2070  1 2130 C          TCF     GIMTRIM +2  RESTART ENTRY....BYPASS 4 SECOND DELAY
A3012                                                                       TST,TRIM SETS +0 ON NORMAL ENTRY

 3013   REF    4  LAST  682   20,2071  31'445 C          CAE     MRKRTMP   CHECK FOR TEST/TRIM OR TRIM ONLY
 3014   REF    8  LAST  683   20,2072  55'447 C          TS      CNTR        MRKRTMP SAVES CNTR FOR RESTARTS
 3015                        20,2073  0 0006 1          EXTEND
 3016   REF    2  LAST  683   20,2074  6 2126 C          BZMF    GIMTRIM   (TRIM ONLY)

 3017   REF  13E  LAST  683   20,2075  4 4714 C  GDTSETUP CS      ZERO      GIMBAL DRIVE TEST SETUP, FOR PITCH
 3018   REF    9  LAST  683   20,2076  55'447 C          TS      CNTR

 3019   REF    1              20,2077  3 2144 1  GIMDTEST CAF     +2ACTDEG  GIMBAL DRIVE TEST, 1ST INCREMENT
 3020   REF    1              20,2100  0 2113 C          TC      OUTPUT      (LEAVES GIMBAL AT +2 DEG)
 3021   REF    1              20,2101  3 2143 C          CAF     -4ACTDEG  2ND INCREMENT (LEAVES GIMBAL AT -2)
 3022   REF    2  LAST  683   20,2102  0 2113 C          TC      OUTPUT
 3023   REF    2  LAST  683   20,2103  3 2144 1          CAF     +2ACTDEG  3RD INCREMENT (LEAVES GIMBAL AT -0)
 3024   REF    3  LAST  683   20,2104  0 2113 C          TC      OUTPUT

 3025   REF   10  LAST  683   20,2105  4 1447 C          CS      CNTR      CHECK FOR COMPLETION OF YAW TEST
 3026   REF  155  LAST  673   20,2106  10 000 C          CCS     A
 3027   REF    3  LAST  683   20,2107  1 2126 1          TCF     GIMTRIM   COMPLETED, GO TO GIMBAL TRIM ROUTINE
 3028   REF   51  LAST  683   20,2110  4 4712 C          CS      BIT1      SET UP YAW TEST
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3029  REF  11  LAST  683   20,2111  55'447 C          TS      CNTR
3030  REF   1             20,2112  1 2077 1          TCF     GIMDTEST        FOR YAW TEST

3031                      20,2113  0 0006 1  OUTPUT  EXTEND                  OUTPUT THE INCREMENT....SAVE Q
3032  REF   4  LAST  382   20,2114  23'146 C          QXCH    TEMPR6C

3033  REF  12  LAST  684   20,2115  51'447 1          INDEX   CNTR
3034  REF   1             20,2116  54 054 1          TS      TVCPITCH

3035  REF  13  LAST  684   20,2117  51'447 1          INDEX   CNTR
3036  REF  21  LAST  656   20,2120  3 4700 1          CAF     BIT11
3037                      20,2121  0 0006 1          EXTEND
3038  REF   6  LAST  185   20,2122  05 014 1          WOR     CHAN14

3039  REF  10  LAST  683   20,2123  0 5156 C          TC      FIXDELAY        WAIT 2SEC, WHILE ASTRONAUT VERIFIES
3040                      20,2124   00310 0          DEC     200                     GIMBAL MOTION ON GPI
3041  REF   5  LAST  684   20,2125  0 1146 C          TC      TEMPR6C

3042  REF  11  LAST  684   20,2126  0 5156 C  GIMTRIM  TC      FIXDELAY        WAIT 4 SECONDS BEFORE GIMBAL TRIM
3043                      20,2127   00620 0          DEC     400

3044  REF 137  LAST  683   20,2130  4 4714 C    +2    CS      ZERO            PICK UP TRIM VALUES AND OUTPUT THEM
3045  REF  14  LAST  668   20,2131  6 1425 0          AD      PACTOFF                 (AVOID +0) ENTRY POINT FROM RSTRTST
3046  REF   2  LAST  684   20,2132  54 054 1          TS      TVCPITCH                ON A RESTART, TO AVOID 4SEC DELAY
3047  REF 138  LAST  684   20,2133  4 4714 C          CS      ZERO
3048  REF   4  LAST  668   20,2134  6 1426 C          AD      YACTOFF
3049  REF   1             20,2135  54 053 C          TS      TVCYAW

3050  REF   2  LAST  164   20,2136  3 4755 1          CAF     PRIO6           RELEASE THE COUNTERS, BITS 11,12
3051                      20,2137  0 0006 1          EXTEND
3052  REF   7  LAST  684   20,2140  05 014 1          WOR     CHAN14

3053  REF  39  LAST  682   20,2141  1 5213 C  ENDS40.6 TCF     TASKOVER

30535                     20,2142   02200 1  OCT02200 OCT     02200           BITS 8,11 FOR CHANNEL 12 TVC/OPTICS
3054                      20,2143   77526 C  -4ACTDEG DEC     -169            -4 DEG, SC.AT 85.41 ARCSEC/BIT (-169D)
3055                      20,2144   00124 0  +2ACTDEG DEC     +84             +2 DEG, SC.AT 85.41 ARCSEC/BIT (+84D)

R3056  CALLED BY ..DONOUN46.. (VERB 48), OR DIRECTLY BY ..FRESHDAP.. (RCS DAP) VIA IBNKCALL

3058  REF   1                                       COUNT   20/S41.2

3059  REF  52  LAST  673   20,2145  3 1466 1  S41.2   CA      DAPDATR1
3060  REF  22  LAST  649   20,2146  7 6214 1          MASK    THREE
3061  REF 156  LAST  683   20,2147  6 0000 1          AD      A
3062  REF   4  LAST  407   20,2150  55'130 C          TS      RATEINDX
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3063                          20,2151  0 0004 C          INHINT
3064  REF  53  LAST  684      20,2152  31'466 1          CAE    DAPDATR1      IS LEM ATTACHED (BITS 14,13 OF DAPDATR1
3065  REF  11  LAST  644      20,2153  7 4371 1          MASK   PRIO30                      =10)
3066  REF   1                 20,2154  6 7705 1          AD     -BIT14        (OCT57777)
3067                          20,2155  0 0006 1          EXTEND
3068  REF   1                 20,2156  1 2163 C          BZF    TOGETHER      YES

3069  REF  29  LAST  683      20,2157  4 4711 C          CS     BIT2          NO, UNSET FLAG
3070  REF  13  LAST  662      20,2160  7 0103 1          MASK   FLAGWRD7
3071  REF  14  LAST  685      20,2161  54 103 1          TS     FLAGWRD7

3072                          20,2162  1 2166 C          TCF    +4

3073  REF  15  LAST  685      20,2163  4 0103 1  TOGETHER CS     FLAGWRD7      ATTACHED, SET FLAG FOR INTEGRATION
3074  REF  30  LAST  685      20,2164  7 4711 C          MASK   BIT2
3075  REF  16  LAST  685      20,2165  26 103 1          ADS    FLAGWRD7

3076                          20,2166  0 0003 1          RELINT

3077  REF  54  LAST  685      20,2167  3 1466 1          CA     DAPDATR1
3078  REF  28  LAST  640      20,2170  7 4707 1          MASK   BIT4
3079                          20,2171  0 0006 1          EXTEND
3080                          20,2172  6 2174 1          BZMF   +2            DEC 46 MEANS NARROW DB
3081  REF   1                 20,2173  3 2274 1          CA     DEC409
3082  REF   1                 20,2174  6 2275 C          AD     DEC46         DEC 455 MEANS WIDE DB
3083  REF   4  LAST  640      20,2175  55'655 1          TS     ADB

3084  REF  55  LAST  685      20,2176  3 1466 1          CA     DAPDATR1
3085  REF  37  LAST  679      20,2177  7 4704 1          MASK   BIT7          QUAD BD
3086                          20,2200  0 0006 1          EXTEND
3087                          20,2201  6 2203 1          BZMF   +2
3088  REF  82  LAST  677      20,2202  3 4712 1          CA     ONE
3089  REF   2  LAST  106      20,2203  55'631 C          TS     XTRANS
3090  REF  56  LAST  685      20,2204  3 1466 1          CA     DAPDATR1
3091  REF  28  LAST  416      20,2205  7 4701 1          MASK   BIT10         QUAD AC
3092                          20,2206  0 0006 1          EXTEND
3093                          20,2207  6 2211 1          BZMF   +2
3094  REF  83  LAST  685      20,2210  4 4712 C          CS     ONE
3095  REF   3  LAST  685      20,2211  27'631 C          ADS    XTRANS

3096                          20,2212  0 0004 C          INHINT
3097                          20,2213  0 0006 1          EXTEND
3098                          20,2214  1 2221 C          BZF    +5            CLEAR NJETSFLG (4 JETS, OR NO JETS)
3099  REF  15  LAST  582      20,2215  4 0075 1          CS     FLAGWRD1      SET NJETSFLG   (2 JETS, AC OR BD QUADS)
3100  REF  33  LAST  651      20,2216  7 4674 1          MASK   BIT15         NJETSFLG = 1 FOR 2 JET ULLAGE (AC OR BD)
3101  REF  16  LAST  685      20,2217  26 075 1          ADS    FLAGWRD1
3102                          20,2220  1 2224 C          TCF    +4
3103  REF  34  LAST  685      20,2221  4 4674 1          CS     BIT15         NJETSFLG = 0 FOR 4 JET (OR 0 JET) ULLAGE
3104  REF  17  LAST  685      20,2222  7 0075 1          MASK   FLAGWRD1
3105  REF  18  LAST  685      20,2223  54 075 1          TS     FLAGWRD1
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3106                                20,2224  0 0003 1          RELINT
3107  REF   2 LAST 272             20,2225  3 1467 C          CA      DAPDATR2
3108  REF  30 LAST 662             20,2226  7 4676 C          MASK    BIT13
3109                                20,2227  0 0006 1          EXTEND
3110                                20,2230  6 2232 C          BZMF    +2
3111                                20,2231  1 2233 C          TCF     +2
3112  REF  84 LAST 685             20,2232  4 4712 C          CS      ONE
3113                                20,2233  4 0000 C          COM
3114  REF   2 LAST 106             20,2234  55'630 1          TS      ACORBD          MINUS FOR A-C,PLUS FOR B-D

3115  REF   3 LAST 686             20,2235  3 1467 C          CA      DAPDATR2
3116  REF  29 LAST 685             20,2236  7 4701 1          MASK    BIT10
3117  REF 157 LAST 684             20,2237  10 000 C          CCS     A
3118                                20,2240  1 2244 C          TCF     +4
3119  REF  85 LAST 686             20,2241  3 4712 1          CA      ONE
3120  REF   2 LAST 106             20,2242  55'626 C          TS      RACFAIL
3121  REF   1                      20,2243  1 2254 1          TCF     BDFAIL
3122  REF 139 LAST 684             20,2244  3 4714 1          CA      ZERO
3123  REF   3 LAST 686             20,2245  55'626 C          TS      RACFAIL
3124  REF   4 LAST 686             20,2246  3 1467 C          CA      DAPDATR2
3125  REF  29 LAST 685             20,2247  7 4707 1          MASK    BIT4
3126  REF 158 LAST 686             20,2250  10 000 C          CCS     A
3127  REF   2 LAST 686             20,2251  1 2254 1          TCF     BDFAIL
3128  REF  66 LAST 686             20,2252  4 4712 C          CS      ONE
3129  REF   4 LAST 686             20,2253  55'626 C          TS      RACFAIL
3130  REF   5 LAST 686             20,2254  3 1467 C  BDFAIL  CA      DAPDATR2
3131  REF  38 LAST 685             20,2255  7 4704 1          MASK    BIT7
3132  REF 159 LAST 686             20,2256  10 000 C          CCS     A
3133                                20,2257  1 2263 C          TCF     +4
3134  REF  87 LAST 686             20,2260  3 4712 1          CA      ONE
3135  REF   2 LAST 106             20,2261  55'627 1          TS      RBDFAIL
3136  REF 165 LAST 659             20,2262  0 0002 C          TC      Q
3137  REF 140 LAST 686             20,2263  3 4714 1          CA      ZERO
3138  REF   3 LAST 686             20,2264  55'627 1          TS      RBDFAIL
3139  REF   6 LAST 686             20,2265  3 1467 C          CA      DAPDATR2
3140  REF  52 LAST 683             20,2266  7 4712 C          MASK    BIT1
3141  REF 160 LAST 686             20,2267  10 000 C          CCS     A
3142  REF 166 LAST 686             20,2270  0 0002 C          TC      Q
3143  REF  88 LAST 686             20,2271  4 4712 C          CS      ONE
3144  REF   4 LAST 686             20,2272  55'627 1          TS      RBDFAIL
3145  REF 167 LAST 686             20,2273  0 0002 C          TC      Q


R3146  DAPFIG ENTRY VIA TC POSTJUMP AS JOB FROM ..STABLISH.. (VERB 46)
3147                                42,3521                   BANK    42
3148  REF   2 LAST 246             42,2000                   SETLOC  EXTVBS
3149                                42,3521                   BANK

3150  REF  25 LAST 662             42,3521  4 4702 1 DAPFIG  CS      BIT9            TURN OFF SIVB TAKEOVER
3151                                42,3522  0 0006 1          EXTEND
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3152  REF  3C  LAST  683   42,3523  03 012 1          WAND    CHAN12
3153  REF  57  LAST  685   42,3524  31'466 1          CAE     DAPDATR1      DETERMINE VEHICLE CONFIGURATION
3154                       42,3525  0 0006 1          EXTEND
3155  REF  23  LAST  642   42,3526  7 4710 1          MP      BIT3              RIGHT SHIFT 4 OCTAL DIGITS
3156  REF  23  LAST  684   42,3527  7 6214 1          MASK    THREE             (IN CASE BIT 15 IS USED)
3157  REF 161  LAST  686   42,3530  5C 000 1          INDEX   A
3158                       42,3531  1 3532 1          TCF     +1                BRANCH BASED ON CONFIG....

3159  REF   1              42,3532  1 3544 C          TCF     NODAPUP       CM.......ACTIVATE NODAP
3160  REF   1              42,3533  1 3537 1          TCF     RCSDAPUP          CSM......ACTIVATE RCSDAP
3161  REF   2  LAST  687   42,3534  1 3537 1          TCF     RCSDAPUP          CSM/LEM..ACTIVATE RCSDAP
3162  REF  42  LAST  654   42,3535  0 4574 C          TC      POSTJUMP
3163  REF   1              42,3536   67210 C          CADR    SATSTKON
3164                       42,3537  0 0004 C  RCSDAPUP INHINT                CALL TO ACTIVATE RCSDAP, AND RETURN
3165  REF  3C  LAST  661   42,3540  0 4633 C          TCR     IBNKCALL
3166  REF   5  LAST  661   42,3541   42010 C          CADR    RCSDAPCN
3167                       42,3542  0 0003 1          RELINT
3168  REF   1              42,3543  1 3561 1          TCF     ENDFIG        CAME IN VIA V46, GO OUT VIA GOPIN
3169                       42,3544  0 0006 1  NODAPUP EXTEND                T5 IDLE FOR NODAP (DONT WORRY ABOUT T)
3170  REF   1              42,3545  3 3564 C          DCA     T5IDLDAP
3171  REF  1C  LAST  649   42,3546  53'313 C          DXCH    T5LOC
3172  REF  44  LAST  661   42,3547  0 5447 C          TC      DOWNFLAG      RESET T5-USAGE FLAGS FOR NODAP
31725 REF   1              42,3550   00132 1          ADRES   DAPBIT1       BIT 15  FLAG 6 = 0
3173  REF  45  LAST  687   42,3551  0 5447 C          TC      DOWNFLAG
31732 REF   1              42,3552   00133 C          ADRES   DAPBIT2       BIT 14  FLAG 6 = 0
31734                      42,3553  0 0004 C          INHINT
31735 REF  31  LAST  687   42,3554  0 4633 C          TC      IBNKCALL      ZERO JET CHANNELS IN 14 MS AND THEN
31736 REF   2  LAST  537   42,3555   42616 C          CADR    ZEROJET       LEAVE THE T6 CLOCK DISABLED.
31738                      42,3556  0 0003 1          RELINT
3174  REF  53  LAST  686   42,3557  3 4712 1          CAF     BIT1          KILL KALCMANU JOB
3175  REF   6  LAST  584   42,3560  55'332 C          TS      HOLDFLAG
3176  REF  43  LAST  687   42,3561  0 4574 C  ENDFIG  TC      POSTJUMP      CAME IN VIA V46, GO OUT VIA GOPIN
3177  REF  28  LAST  537   42,3562   66125 1          CADR    GOPIN
3178  REF  15  LAST  684   E6,1425                    EBANK=  PACTOFF
3179  REF   5  LAST  643   42,3563   03132 1  T5IDLDAP 2CADR  T5IDLOC
3179                       42,3564   12106 C

3180                       17,2032                    BANK    17
3181  REF   3  LAST  682   20,2000                    SETLOC  DAPS6
3182                       20,2274                    BANK

3183                       20,2274   00631 C  DEC409   DEC     409
3184                       20,2275   00056 1  DEC46    DEC     46


R3185  CALLED BY ..DONOUN47.. (VERB 48), OR DIRECTLY BY ..FRESHDAP.. (RCS DAP)

3186  REF   1              20,2276  31'470 C  S40.14   CAE     IXX           RCS ENTRY
3187                       20,2277  0 0006 1          EXTEND
3188  REF   1              20,2300  7 2323 C          MP      CONTCNE
```

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3189   REF   2  LAST  106   20,2301  55'623 C            TS      J/M

3190   REF   1              20,2302  3 1471 1            CA      IAVG
3191                        20,2303  0 0006 1            EXTEND
3192   REF   2  LAST  687   20,2304  7 2323 C            MP      CONTONE
3193   REF   2  LAST  106   20,2305  55'624 1            TS      J/M1

3194   REF   2  LAST  106   20,2306  55'625 C            TS      J/M2

3195                        20,2307  0 0006 1            EXTEND
3196   REF   1              20,2310  3 2325 1            DCA     CONTTWO
3197                        20,2311  0 0006 1            EXTEND
3198   REF   2  LAST  687   20,2312  11'470 1            DV      IXX
3199   REF   2  LAST  106   20,2313  55'620 C            TS      KMJ

3200                        20,2314  0 0006 1            EXTEND
3201   REF   2  LAST  688   20,2315  3 2325 1            DCA     CONTTWO
3202                        20,2316  0 0006 1            EXTEND
3203   REF   2  LAST  688   20,2317  11'471 C            DV      IAVG
3204   REF   2  LAST  106   20,2320  55'621 1            TS      KMJ1

3205   REF   2  LAST  106   20,2321  55'622 1            TS      KMJ2

3206   REF 168  LAST  686   20,2322  0 0002 C            TC      Q

3207                        20,2323  25137 0  CONTONE    DEC     .662034         2PI/M
3208                        20,2324  00023 C  CONTTWO    2DEC    .00118
3208                        20,2325  12522 1
3209   REF   1                                          COUNT   24/TVNG

3210                        31,3215                     BANK    31
3211   REF   3  LAST  667   24,2000                     SETLOC  P40S
3212                        24,3701                     BANK

3213                        24,3701  37405 1  POS-2.5    OCT     37405
3214   REF  58  LAST  687   E6,1466                     EBANK=  DAPDATR1
3215   REF   1              24,3702  02000 C  RCSCADR   2CADR   RCSUP
3215   REF   1              24,3703  42106 C
3216                        24,3704  37704 C   6SECTS    OCT     37704
3218   REF   1                                          COUNT   21/RCSUP

3219                        20,2326                     BANK    20

3220   REF   1              21,2000                     SETLOC  DAPS3
3221                        21,2000                     BANK

3222   REF   6  LAST  575   21,2000  22 016 0  RCSUP     LXCH    BANKRUPT
3223                        21,2001  0 0006 1            EXTEND
3224   REF   6  LAST  576   21,2002  22 012 1            QXCH    QRUPT
```

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3225   REF   6  LAST  687   21,2003  0 2010 1          TCR     RCSDAPON        ACTIVATE RCS DAP

3226   REF  27  LAST  538   21,2004  1 5222 1          TCF     RESUME

3227   REF  59  LAST  688   E6,1466                    EBANK=  DAPDATR1
3228   REF   2  LAST  199   21,2005   02106 1  RCSADDR 2CADR   RCSATT
3228                        21,2006   42106 C

3229                        21,2007   37704 C  0.6SECTS OCT    37704

A3230                                                                  RCSDAPON ENTRY MUST BE UNDER INT-INHIBIT
3231   REF   1              21,2010  3 2007 1  RCSDAPON CAF    0.6SECTS  0.6 SEC ALLOWS TVCEXEC/ROLLDAP TO DIE
3232   REF   7  LAST  649   21,2011  54 030 C    +1     TS     TIME5     ENTRY FROM ROOTOPOO
3233   REF   1              21,2012  55'465 C           TS     T5PHASE   WILL CAUSE FRESHDAP (+1)

3234   REF  10  LAST  537   21,2013  4 1501 C           CS     RCSFLAGS  SET BIT3 TO REINITIALIZE FDAI ERROR
3235   REF  24  LAST  687   21,2014  7 4710 1           MASK   BIT3             DISPLAY, IN CASE SC CONT SWITCH
3236   REF  11  LAST  689   21,2015  27'501 C           ADS    RCSFLAGS          IN SCS NOT GNC (GUIDEMODE PRIMARY)

3237                        21,2016  0 0006 1          EXTEND
3238   REF   1              21,2017  3 2006 C          DCA    RCSADDR   (RCSATT)
3239   REF  11  LAST  687   21,2020  53'313 C          DXCH   T5LOC

3240   REF  11  LAST  682   21,2021  4 4105 C          CS     OCT60000  SET BITS 15,14  TO  01  TO INDICATE
3241   REF  22  LAST  682   21,2022  7 0102 C          MASK   FLAGWRD6        T5 TAKEOVER BY RCSDAP
3242   REF  40  LAST  673   21,2023  6 4675 1          AD     BIT14
3243   REF  23  LAST  689   21,2024  54 102 C          TS     FLAGWRD6  KILLS TVCEXEC AND ROLLDAP STARTS

3244   REF 169  LAST  688   21,2025  0 0002 C          TC     Q         RETURN TO CALLER (TVCDAPOF OR RCSDAPUP)
```

L P51-P53 USER'S PAGE NO. 1 EO S4

R0001 PROGRAM NAME- PROG52 DATE- NOV 30, 1966
R0003 MCD NO- 2 LOG SECTION- P51-P53
R0005 MODIFICATION BY- LONSKE ASSEMBLY- SUNDISK REV 30

R0007 FUNCTIONAL DESCRIPTION-

R0008 ALIGNS THE IMU TO ONE OF THREE ORIENTATIONS SELECTED BY THE ASTRONAUT. THE PRESENT IMU ORIENTATION IS KNOWN
R0010 AND IS STORED IN REFSMMAT. THE THREE POSSIBLE ORIENTATIONS MAY BE_

R0011 (A) PREFERRED ORIENTATION

R0012 AN OPTIMUM ORIENTATION FOR A PREVIOUSLY CALCULATED MANUEVER. THIS ORIENTATION MUST BE CALCULATED AND
R0014 STORED BY A PREVIOUSLY SELECTED PROGRAM.

R0015 (B) NOMINAL ORIENTATION

R0016 X = UNIT(Y X Z)
R0017 -SM -SM -SM

R0018 Y = UNIT(V X R)
R0019 -SM - -

R0020 Z = UNIT(-R)
R0021 -SM -

R0022 WHERE_
R0023 R = THE GEOCENTRIC RADIUS VECTOR AT TIME T(ALIGN) SELECTED BY THE ASTRONAUT
R0025 -

R0026 V = THE INERTIAL VELOCITY VECTOR AT TIME T(ALIGN) SELECTED BY THE ASTRONAUT
R0028 -

R0029 (C) REFSMMAT ORIENTATION

R0030 THIS SELECTION CORRECTS THE PRESENT IMU ORIENTATION. THE PRESENT ORIENTATION DIFFERS FROM THAT TO WHICH IT
R0032 WAS LAST ALIGNED ONLY DUE TO GYRO DRIFT(I.E. NEITHER GIMBAL LOCK NOR IMU POWER INTERRUPTION HAS OCCURED
R0034 SINCE THE LAST ALIGNMENT).

R0035 AFTER A IMU ORIENTATION HAS BEEN SELECTED ROUTINE S52.2 IS OPERATED TO COMPUTE THE GIMBAL ANGLES USING THE
R0037 NEW ORIENTATION AND THE PRESENT VEHICLE ATTITUDE. CAL52A THEN USES THESE ANGLES, STORED IN THETAD,+1,+2, TO
R0039 COARSE ALIGN THE IMU. THE STAR SELECTION ROUTINE, R56, IS THEN OPERATED. IF 2 STARS ARE NOT AVAILABLE AN ALARM
R0041 IS FLASHED TO NOTIFY THE ASTRONAUT. AT THIS POINT THE ASTRONAUT WILL MANUEVER THE VEHICLE AND SELECT 2 STARS
R0043 EITHER MANUALLY OR AUTOMATICALLY. AFTER 2 STARS HAVE BEEN SELECTED THE IMU IS FINE ALIGNED USING ROUTINE R51. IF
R0045 THE RENDEZVOUS NAVIGATION PROCESS IS OPERATING(INDICATED BY RNDVZFLG) P20 IS DISPLAYED. OTHERWISE P00 IS
R0047 REQUESTED.

R0048 CALLING SEQUENCE-

R0049 THE PROGRAM IS CALLED BY THE ASTRONAUT BY DSKY ENTRY.

R0050 SUBROUTINES CALLED-

R0051	1. FLAGDOWN	7. S52.2	13. NEWMODEX
R0052	2. RG2BOTH	8. CAL53A	14. PRIOLARM
R0053	3. GOPERF4	9. FLAGUP	
R0054	4. MATMOVE	10. R56	
R0055	5. GOFLASH	11. R51	
R0056	6. S52.3	12. GOPERF3	

R0057 NORMAL EXIT MODES-

R0058 EXITS TO ENDOFJOB

R0059 ALARM OR ABORT EXIT MODES-

R0060 NONE

R0061 OUTPUT-

R0062 THE FOLLOWING MAY BE FLASHED ON THE DSKY
R0063 1. IMU ORIENTATION CODE
R0064 2. ALARM CODE 215 -PREFERRED IMU ORIENTATION NOT SPECIFIED
R0065 3. TIME OF NEXT IGNITION
R0066 4. GIMBAL ANGLES
R0067 5. ALARM CODE 405 -TWO STARS NOT AVAILABLE
R0068 6. PLEASE PERFORM R00
R0069 THE MODE DISPLAY MAY BE CHANGED TO 20

R0070 ERASABLE INITIALIZATION REQUIRED-

R0071 PFRATFLG SHOULD BE SET IF A PREFERRED ORIENTATION HAS BEEN COMPUTED.IF IT HAS BEEN COMPUTED IT IS STORED IN
R0073 XSMD,YSMD,ZSMD.
R0074 RNDV2FLG INDICATES WHETHER THE RENDEZVOUS NAVIGATION PROCESS IS OPERATING.

R0076 DEBRIS-

R0077 WORK AREA
0078 REF 3 LAST 208 15,2000 P54 = PROG52
0079 33,3773 BANK 33
0080 REF 1 15,2000 SETLOC P50S
0081 15,2000 BANK

0082 REF 4 LAST 448 30,2000 SBANK= LOWSUPER
0083 REF 7 LAST 444 E5,1773 EBANK= SAC
0084 REF 1 COUNT 15/P52

0085 REF 63 LAST 680 15,2000 0 5301 C PROG52 TC PHASCHNG
0086 15,2001 00254 1 OCT 00254
0087 REF 46 LAST 687 15,2002 0 5447 C TC DOWNFLAG
00875 REF 17 LAST 636 15,2003 00027 1 ADRES UPDATFLG BIT 7 FLAG 1

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0088   REF  47  LAST  691   15,2004  0 5447 C          TC      DOWNFLAG
00885  REF   7  LAST  636   15,2005   00031 C          ADRES   TRACKFLG      BIT 5  FLAG 1
0089   REF 173  LAST  658   15,2006  0 4555 C          TC      BANKCALL
0090   REF   6  LAST  644   15,2007   17573 C          CADR    R02BCTH       IMU STATUS CHECK
0091   REF  30  LAST  686   15,2010  3 4707 C          CAF     BIT4
0092   REF  37  LAST  627   15,2011  7 0076 1          MASK    STATE +2      IS PFRATFLG SET(PREFERRED ORIENTATION)
0093   REF 162  LAST  687   15,2012  10 000 C          CCS     A
0094   REF   1               15,2013  0 2016 1          TC      P52A          YES
0095   REF  31  LAST  685   15,2014  3 4711 1          CAF     BIT2          NO
0096   REF   2  LAST  692   15,2015  0 2017 C          TC      P52A +1
0097   REF  54  LAST  687   15,2016  3 4712 1  P52A    CAF     BIT1
0098   REF   8  LAST  548   15,2017  55'132 1          TS      OPTION2
0099   REF  55  LAST  692   15,2020  3 4712 1  P52B    CAF     BIT1
0100   REF 174  LAST  692   15,2021  0 4555 C          TC      BANKCALL      FLASH OPTION CODE AND ORIENTATION CODE
0101   REF   1               15,2022   21041 1          CADR    GOPERF4R
0102   REF  42  LAST  645   15,2023  0 4106 1          TC      GOTOPOOH
0103                         15,2024  0 2031 1          TC      +5
0104   REF   1               15,2025  0 2020 1          TC      P52B          NEW CODE - NEW ORIENTATION CODE INPUT
0105   REF  64  LAST  691   15,2026  0 5301 C          TC      PHASCHNG
0106                         15,2027   00014 1          OCT     00014
0107   REF  90  LAST  680   15,2030  0 5112 C          TC      ENDOFJOB
0108   REF   9  LAST  692   15,2031  3 1132 0          CA      OPTION2
0109   REF  24  LAST  687   15,2032  7 6214 1          MASK    THREE
0110   REF 163  LAST  692   15,2033  50 000 1          INDEX   A
0111                         15,2034  0 2035 C          TC      +1
0112   REF   1               15,2035  0 2041 C          TC      P52T          L.S.
0113   REF   1               15,2036  0 2110 C          TC      P52J          PREF
0114   REF   2  LAST  692   15,2037  0 2041 C          TC      P52T          NOM
0115   REF   1               15,2040  1 2120 1          TCF     P52C          REF
0116                         15,2041  0 0006 1  P52T    EXTEND
0117   REF  13  LAST  649   15,2042  3 4714 1          DCA     NEGO
0118   REF  32  LAST  516   15,2043  53'046 C          DXCH    DSPTEM1
0119   REF   1               15,2044  3 2155 1          CAF     V06N34
0120   REF 175  LAST  692   15,2045  0 4555 C          TC      BANKCALL
0121   REF  28  LAST  645   15,2046   20624 C          CADR    GOFLASH
0122   REF  43  LAST  692   15,2047  0 4106 1          TC      GOTOPOOH
0123                         15,2050  0 2052 1          TC      +2
0124                         15,2051  0 2044 C          TC      -5
0125                         15,2052  0 0006 1          EXTEND
0126   REF  33  LAST  692   15,2053  3 1046 1          DCA     DSPTEM1
0127                         15,2054  0 0006 1          EXTEND
0128                         15,2055  1 2057 C          BZF     +2
0129                         15,2056  1 2062 C          TCF     +4

0130                         15,2057  0 0006 1          EXTEND
0131   REF  24  LAST  656   15,2060  3 0025 0          DCA     TIME2
0132   REF  34  LAST  692   15,2061  53'046 C          DXCH    DSPTEM1
0133   REF  10  LAST  692   15,2062  3 1132 C          CA      OPTION2
0134   REF  32  LAST  692   15,2063  7 4711 C          MASK    BIT2
0135   REF 164  LAST  692   15,2064  10 000 C          CCS     A
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0136                              15,2065  1 2073 C            TCF     +6              NOM
0137   REF 157  LAST  680         15,2066  0 6006 1            TC      INTPRET         LS
0138                              15,2067   77624 1            CALL
0139   REF   1                   15,2070   34506 C                    P52LS
0140                              15,2071   77650 1            GOTO
0141   REF   1                   15,2072   32100 1                    P52D
0142   REF 158  LAST  693         15,2073  0 6006 1            TC      INTPRET
0143                              15,2074   77745 1            DLOAD
0144   REF  35  LAST  692         15,2075   01046 1                    DSPTEM1
0145                              15,2076   77624 1            CALL            COMPUTE NOMINAL IMU
0146   REF   1                   15,2077   34636 C                    S52.3            ORIENTATION
0147                              15,2100   77624 1  P52D      CALL            READ VEHICLE ATTITUDE AND
0148   REF   1                   15,2101   22256 C                    S52.2            COMPUTE GIMBAL ANGLES
0149                              15,2102   77776 1            EXIT
0150   REF   1                   15,2103  3 2156 1            CAF     V06N22
0151   REF 176  LAST  692         15,2104  0 4555 C            TC      BANKCALL        DISPLAY GIMBAL ANGLES
0152   REF  29  LAST  692         15,2105   20624 C            CADR    GOFLASH
0153   REF  44  LAST  692         15,2106  0 4106 1            TC      GOTOPOOH
0154                              15,2107  0 2113 C            TC      +4              PROCEED
0155   REF 159  LAST  693         15,2110  0 6006 1  P52J      TC      INTPRET         RECYCLE- VEHICLE HAS BEEN MENUEVERED
0156                              15,2111   77650 1            GOTO
0157   REF   2  LAST  693         15,2112   32100 1                    P52D
0158   REF 160  LAST  693         15,2113  0 6006 1            TC      INTPRET
0159                              15,2114   77624 1            CALL            DO COARSE ALIGN
0160   REF   1                   15,2115   30763 C                    CAL53A           ROUTINE
0161                              15,2116   77414 C            SET     EXIT
0162   REF   5  LAST  609         15,2117   01462 C                    REFSMFLG
0163   REF   1                   15,2120  3 4720 C  P52C      CAF     ALRM15
0164   REF 177  LAST  693         15,2121  0 4555 C            TC      BANKCALL
0165   REF   3  LAST  638         15,2122   20751 C            CADR    GOPERF1
0166   REF  45  LAST  693         15,2123  0 4106 1            TC      GOTOPOOH
0167                              15,2124  0 2126 C            TC      +2              V33
0168   REF   1                   15,2125  0 2140 C            TC      P52F            E
0169   REF 161  LAST  693         15,2126  0 6006 1            TC      INTPRET
0170                              15,2127   43234 C            RTB     DAD
0171   REF  19  LAST  610         15,2130   45505 C                    LOADTIME
0172   REF   1                   15,2131   32176 C                    TSIGHT1
0173                              15,2132   77624 1            CALL
0174   REF   1                   15,2133   30216 1                    LOCSAM
0175                              15,2134   77776 1            EXIT
0176   REF 178  LAST  693         15,2135  0 4555 0  P52E      TC      BANKCALL        DO STAR SELECTION
0177   REF   1                   15,2136   30324 1            CADR    PICAPAR
0178   REF   1                   15,2137  0 2145 C            TC      P52I            2 STARS NOT AVAILABLE
0179   REF 162  LAST  693         15,2140  0 6006 1  P52F      TC      INTPRET         2 STARS AVAILABLE
0180                              15,2141   77624 1            CALL
0181   REF   2  LAST  208         15,2142   30523 C                    R51
0182                              15,2143   77776 1  ENDP50S   EXIT
0183   REF  46  LAST  693         15,2144  0 4106 1            TC      GOTOPOOH
0196   REF  27  LAST  675         15,2145  0 5537 C  P52I      TC      ALARM
0197                              15,2146   00405 C            OCT     405
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 0198   REF   3  LAST  549   15,2147  3 4743 C            CAF     V05NC9
 0199   REF 179  LAST  693   15,2150  0 4555 C            TC      BANKCALL
 0200   REF  30  LAST  693   15,2151   20624 C            CADR    GOFLASH
 0201   REF  47  LAST  693   15,2152  0 4106 1            TC      GOTOPOOH
 0202   REF   2  LAST  693   15,2153  0 2140 C            TC      P52F          PROCEED - DO FINE ALIGN-R51
 0203   REF   2  LAST  692   15,2154  0 2120 C            TC      P52C          RECYCLE- VEHICLE HAS BEEN MANUEVERED
 0204                        15,2155   01442 1  V06N34    VN      00634
 0205                        15,2156   01426 C  VB6N22    VN      00622
 0206   REF   2  LAST  152     4720             ALRM15    EQUALS  OCT15
 0207   REF   1                16,2000                    SETLOC  P50S2
 0208                        16,2505                    BANK
 0209                        16,2505   01531 1  V06N89*   VN      0689
R0210   NAME-P52LS
R0211   FUNCTION - TO DISPLAY THE LANDING SITE LATITUDE,
R0212   LONGITUDE AND ALTITUDE. TO ACCEPT NEW DATA VIA
R0213   THE KEYBOARD. TO COMPUTE THE LANDING SITE
R0214   ORIENTATION FOR P52 OR P54
R0215
R0216   LET:
R0217      RLS = LANDING SITE VECTOR IN REF COORDINATES
R0218      R   = CSM POSITION VECTOR IN REF COORDINATES
R0219      V   = CSM VELOCITY VECTOR IN REF COORDINATES
R0220   THEN THE LANDING SITE ORIENTATION IS:
R0221      XSMD = UNIT(RLS)
R0222      YSMD = UNIT(ZSMD*XSMD)
R0223      ZSMD = UNIT((R*V)*RLS)
R0224   CALL -   CALL
R0225                  P52LS
R0226   INPUTS-  DSPTEM1=TIME OF ALIGNMENT
R0227            RLS=LANDING SITE VECTOR IN MOON FIXED COORINATES
R0228   OUTPUTS- XSMD,YSMD,ZSMD
R0229   SUBROUTINES- RP-TC-R ,LAT-LONG,LLASRD,LLASRDA,CSMPREC
R0230   DEBRIS- VAC, SEE SUBROUTINES
R0231
 0232                        16,2506   43020 1  P52LS     STQ     SET
 0233   REF   2  LAST   69   16,2507   00300 1                    QMAJ
 0234   REF  16  LAST  619   16,2510   01463 1                    LUNAFLAG
 0235                        16,2511   77745 1            DLOAD
 0236   REF  36  LAST  693   16,2512   01046 1                    DSPTEM1
 0237   REF   2  LAST   90   16,2513   02607 1            STORE   TSIGHT
 0238                        16,2514   43175 C            VLOAD   SET
 0239   REF   7  LAST  597   16,2515   02026 1                    RLS
 0240   REF   7  LAST  633   16,2516   00462 1                    ERADFLAG
 0241                        16,2517   14001 C            STODL   OD
 0242   REF   3  LAST  694   16,2520   02607 1                    TSIGHT
 0243                        16,2521   34007 1            STCALL  6D
 0244   REF   3  LAST  594   16,2522   55341 1                    RP-TC-R
 0245                        16,2523   77742 C            VSR2
 0246   REF   8  LAST  616   16,2524   16152 C            STODL   ALPHAV
 0247   REF   4  LAST  694   16,2525   02607 1                    TSIGHT
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0248                                    16,2526   77624 1           CALL
0249  REF   4  LAST  597                16,2527   26322 0                 LAT-LONG
0252                                    16,2530   77624 1           CALL
0253  REF   2  LAST  597                16,2531   61336 0                 LLASRD
0254                                    16,2532   77776 1           EXIT
0255  REF   1                          16,2533   3 2505 0  LSDISP  CAF     V06N89*
0256  REF 180  LAST  694                16,2534   0 4555 0        TC      BANKCALL
0257  REF  31  LAST  694                16,2535    20624 0        CADR    GOFLASH
0258  REF  48  LAST  694                16,2536   0 4106 1        TC      GOTOPOOH
0259                                    16,2537   0 2541 0        TC      +2
0260  REF   1                          16,2540   0 2533 0        TC      LSDISP
0261  REF 163  LAST  693                16,2541   0 6006 1        TC      INTPRET
0262                                    16,2542   77624 1           CALL
0263  REF   3  LAST  612                16,2543   61345 1                 LLASRDA
0264                                    16,2544   45145 0           DLOAD   CALL
0265  REF   5  LAST  694                16,2545   02607 1                 TSIGHT
0266  REF   5  LAST  633                16,2546   26373 1                 LALOTORV
0267                                    16,2547   53575 0           VLOAD   UNIT
0268  REF   9  LAST  694                16,2550   02152 0                 ALPHAV
0269  REF   3  LAST   70                16,2551   14307 0           STODL   XSMD
0270  REF   6  LAST  695                16,2552   02607 1                 TSIGHT
0271  REF  38  LAST  665                16,2553   34041 0           STCALL  TDEC1
0272  REF   5  LAST  596                16,2554   27022 1                 CSMPREC
0273                                    16,2555   47375 0           VLOAD   VXV
0274  REF  22  LAST  665                16,2556   00001 0                 RATT
0275  REF  18  LAST  665                16,2557   00007 0                 VATT
0276                                    16,2560   53435 0           VXV     UNIT
0277  REF   4  LAST  695                16,2561   00307 0                 XSMD
0278  REF   2  LAST   70                16,2562   00323 0           STORE   ZSMD
0279                                    16,2563   53435 0           VXV     UNIT
0280  REF   5  LAST  695                16,2564   00307 0                 XSMD
0281  REF   3  LAST   70                16,2565   34315 1           STCALL  YSMD
0282  REF   3  LAST  694                16,2566   00300 1                 QMAJ
0283  REF   1                          14,2000                     SETLOC  P50S1
0284                                    14,2002                     BANK
R0285  NAME- AUTOMATIC OPTICS POSITIONING ROUTINE

R0286  FUNCTION- (1) TO POINT THE STAR LOS OF THE OPTICS AT A STAR OR LANDMARK DEFINED BY THE PROGRAM OR BY DSKY INPUT.
R0288             (2) TO POINT THE STAR LOS OF THE OPTICS AT THE LEM DURING RENDEZVOUS TRACKING OPERATIONS.

R0290  CALLING SEQUENCE- CALL R52

R0291  INPUT- 1. TARG1FLG AND TARG2FLG- PRESET BY CALLER
R0292         2. RNDV2FLG AND TRACKFLG- PRESET BY CALLER
R0293         3. STAR CODE- PRESET BY CALLER. ALSO INPUT THROUGH DSKY
R0294         4. LAT, LONG AND ALT OF LANDMARK- INPUT THROUGH DSKY
R0295         5. NO. OF MARKS(MARKINDX)- PRESET BY CALLER

R0296  OUTPUT-  DRIVE SHAFT AND TRUNNION CDUS
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R0297   SUBROUTINES- 1. FIXDELAY          7. CLEANDSP
R0298                2. GOPERF1          8. GOTOSPR
R0299                3. GOFLASH          9. REFLASHR
R0300                4. R53             10. R52.2
R0301                5. ALARM           11. R52.3
R0302                6. SR52.1

 0303   REF   1                                        COUNT  15/R52

 0304                          14,2002   43020  1 R52   STQ    CLEAR
 0305   REF   2  LAST   90     14,2003   02576  1       STQ    SAVQR52
 0306   REF   1                14,2004   04265  1       STQ    ADVTRK
 0307                          14,2005   77776  1 R52VR8 EXIT
 0308                          14,2006   0 0006 1       EXTEND
 0309   REF   8  LAST  498     14,2007   3 0036 1       DCA    CDUT
 0310   REF   6  LAST  444     14,2010   53*161 1       DXCH   DESOPTT
 0311   REF 164  LAST  695     14,2011   0 6006 1       TC     INTPRET
 0312                          14,2012   43131  0       SSP    CLEAR
 0313   REF  25  LAST  683     14,2013   01304  1       STQ    OPTIND
 0314                          14,2014   00000  1       STQ    0
 0315   REF   1                14,2015   00271  0       STQ    R53FLAG
 0316                          14,2016   77776  1       EXIT
 0317   REF 165  LAST  696     14,2017   0 6006 1 R52A   TC     INTPRET
 0318                          14,2020   43014  0       SET    BON
 0319   REF   1                14,2021   00073  0       SET    TRUNFLAG
 0320   REF   5  LAST  608     14,2022   00705  0       SET    TARGIFLG
 0321   REF   1                14,2023   30103  0       SET    R52H
 0322                          14,2024   77414  0       CLEAR  EXIT
 0323   REF   1                14,2025   03660  1       SET    TERMIFLG
 0324   REF   8  LAST  235     14,2026   3 1314 0 R52C   CA     SWSAMPLE        IS OPTICS MODE IN AGC
 0325                          14,2027   0 0006 1       EXTEND
 0326   REF   1                14,2030   6 2131 0       BZMF   R52M            MANUAL
 0327   REF 181  LAST  695     14,2031   0 4555 0 R52D   TC     BANKCALL        AGC
 0328   REF   1                14,2032    26176 0       CADR   SR52.1
 0329   REF   1                14,2033   1 2161 1       TCF    R52L            GR 90 DEGREES
 0330   REF   1                14,2034   1 2124 0       TCF    R52J            GR 50 DEGREES
 0331   REF  43  LAST  660     14,2035   0 5435 0       TC     UPFLAG          LS 50 DEGREES
 0332   REF   2  LAST  696     14,2036    00013 0       ADRES  TRUNFLAG        SET TRUNFLAG  BIT 4  FLAG 0
 0333   REF  30  LAST  686     14,2037   3 4701 0 R52JA  CAF    BIT10           IS THIS A LEM
 0334   REF  38  LAST  692     14,2040   7 0075 1       MASK   STATE +1
 0335   REF 169  LAST  692     14,2041   10 000 0       CCS    A
 0336   REF   1                14,2042   0 2052 1       TC     R52E            YES
 0337   REF  34  LAST  548     14,2043   3 4705 1       CAF    BIT6            NO, IS R53FLAG SET
 0338   REF  39  LAST  696     14,2044   7 0074 0       MASK   STATE
 0339   REF 166  LAST  696     14,2045   10 000 0       CCS    A
 0340   REF   2  LAST  696     14,2046   1 2052 0       TCF    R52E            YES
 0341   REF   1                14,2047   3 2151 0       CAF    V06N92          NO
 0342   REF 182  LAST  696     14,2050   0 4555 0       TC     BANKCALL
 0343   REF   2  LAST  382     14,2051    20602 1       CADR   GODSPR
 0344   REF   9  LAST  696     14,2052   3 1314 0 R52E   CA     SWSAMPLE        IS OSS IN CMC MODE
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0345                                14,2053  0 0006 1           EXTEND
0346  REF   1                      14,2054  6 2065 C           BZMF    R52F            NO
0347  REF  40  LAST  696           14,2055  4 0074 C           CS      STATE           YES- IS TRUNFLAG SET
0348  REF  31  LAST  692           14,2056  7 4707 1           MASK    BIT4
0349  REF 167  LAST  696           14,2057  10 000 C           CCS     A
0350                                14,2060  0 2063 C           TC      +3              NO
0351  REF   7  LAST  444           14,2061  3 1775 C           CA      PAC             YES
0352  REF   7  LAST  696           14,2062  55'160 C           TS      DESOPTT
0353  REF   8  LAST  691           14,2063  3 1773 C           CA      SAC
0354  REF   5  LAST  444           14,2064  55'161 1           TS      DESOPTS
0355  REF   4  LAST  525           14,2065  3 4731 C  R52F     CAF     .5SEC           WAIT 1/2 SEC
0356  REF 163  LAST  696           14,2066  0 4555 C           TC      BANKCALL
0357  REF  10  LAST  640           14,2067   01730 1           CADR    DELAYJOB
0358  REF  31  LAST  696           14,2070  3 4701 C           CAF     BIT10
0359  REF  41  LAST  697           14,2071  7 0075 1           MASK    STATE +1
0360  REF 168  LAST  697           14,2072  10 000 C           CCS     A
0361  REF   1                      14,2073  1 2104 1           TCF     R52HA           YES, LEM
0362  REF  35  LAST  685           14,2074  3 4674 C           CAF     BIT15           NO
0363  REF  42  LAST  697           14,2075  7 0103 1           MASK    STATE +7        IS TERMIFLG SET
0364                                14,2076  0 0006 1           EXTEND
0365  REF   1                      14,2077  1 2026 C           BZF     R52C            NO
0366  REF 166  LAST  696           14,2100  0 6006 1  R52Q     TC      INTPRET         YES
0367                                14,2101   77650 1           GOTO
0368  REF   3  LAST  696           14,2102   02576 1                   SAVQR52
0369                                14,2103   77776 1  R52H     EXIT                    LEM
0370  REF 164  LAST  697           14,2104  0 4555 C  R52HA    TC      BANKCALL
0371  REF   2  LAST  552           14,2105   76536 C           CADR    R61CSM
0372  REF  43  LAST  697           14,2106  3 0075 C           CA      STATE +1
0373  REF  31  LAST  609           14,2107  7 4706 C           MASK    BIT5
0374                                14,2110  0 0006 1           EXTEND                  TRACKFLG
0375  REF   1                      14,2111  1 2100 C           BZF     R52Q

03751 REF  44  LAST  697           14,2112  4 0075 1           CS      STATE +1
03752 REF  39  LAST  686           14,2113  7 4704 1           MASK    BIT7            UPDATFLG
03753 REF 169  LAST  697           14,2114  10 000 C           CCS     A
03754 REF   1                      14,2115  1 2122 C           TCF     R52SYNC

0376  REF  45  LAST  697           14,2116  3 0101 1  R52I     CA      STATE +5
0377  REF  32  LAST  697           14,2117  7 4701 1           MASK    BIT10
0378  REF 170  LAST  697           14,2120  10 000 C           CCS     A
0379  REF   1                      14,2121  0 2031 1           TC      R52O            PRFTRKAT = 1
0380  REF   1                      14,2122  3 2175 C  R52SYNC  CAF     1.8SEC          MAKE UP FOR LOST TIME
03801 REF   2  LAST  697           14,2123  1 2066 1           TCF     R52F +1

0381  REF  48  LAST  692           14,2124  0 5447 C  R52J     TC      DOWNFLAG        CLEAR TRUNFLAG
0382  REF   3  LAST  696           14,2125   00013 C           ADRES   TRUNFLAG        BIT 4  FLAG 0
0383  REF  28  LAST  693           14,2126  0 5537 C           TC      ALARM           SET 407 ALARM
0384                                14,2127   00407 1           OCT     407
0385  REF   1                      14,2130  0 2037 1           TC      R52JA
0386  REF  35  LAST  696           14,2131  3 4705 1  R52M     CAF     BIT6            IS R53FLAG SET
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0387  REF  46  LAST  697   14,2132  7 0074 C            MASK   STATE
0388  REF 171  LAST  697   14,2133  10 000 C            CCS    A
0389  REF   3  LAST  697   14,2134  0 2065 C            TC     R52F          YES
0390                        14,2135  0 0004 C            INHINT               NO
0391  REF   1               14,2136  3 7661 1            CAF    PRIO24
0392  REF  26  LAST  662   14,2137  0 5042 1            TC     FINDVAC
0393  REF   9  LAST  697   E5,1773                       EBANK= SAC
0394  REF   1               14,2140   02144 1           2CADR  R53JOB
0394  REF   1               14,2141   30065 1
0395                        14,2142  0 0003 1            RELINT
0396  REF   4  LAST  698   14,2143  1 2065 1            TCF    R52F
0397  REF 167  LAST  697   14,2144  0 6006 1  R53JOB    TC     INTPRET
0398                        14,2145   77624 1           CALL
0399  REF   2  LAST  609   14,2146   31327 C                  R53
0400                        14,2147   77776 1  ENDPLAC  EXIT                 INTERPRETER RETURN TO ENDOFJOB(R22 USES)
0401  REF  51  LAST  692   14,2150  0 5112 C            TC     ENDOFJOB
0402                        14,2151   01534 1  V06N92   VN     00692
0403                        14,2152   01531 1  V06N89A  VN     0689
0404                        14,2153   10464 C  SHAXIS   2DEC   .5376381241 B-1
0404                        14,2154   12470 1

0405                        14,2155   00000 1            2DEC   0
0405                        14,2156   00000 1
0406                        14,2157   15373 1            2DEC   .8431766920 B-1
0406                        14,2160   11554 C
0407  REF  33  LAST  697   14,2161  3 4701 C  R52L     CAF    BIT1C         IS THIS A LEM
0408  REF  47  LAST  698   14,2162  7 0075 1            MASK   STATE +1
0409  REF 172  LAST  698   14,2163  10 000 C            CCS    A
0410  REF   2  LAST  696   14,2164  0 2124 1            TC     R52J          YES
0411  REF   1               14,2165  3 2174 1            CAF    OCT404
0412  REF 185  LAST  697   14,2166  0 4555 C            TC     BANKCALL
0413  REF   1               14,2167   21671 1           CADR   PRIOLARM
0414  REF   2  LAST  225   14,2170  1 2176 1            TCF    TERM52        TERMINATE
0415  REF   5  LAST  698   14,2171  1 2065 1            TCF    R52F          PROCEED
0416  REF   6  LAST  698   14,2172  1 2065 1            TCF    R52F          NO PROVISION FOR NEW DATA
0417  REF  92  LAST  698   14,2173  1 5112 1            TCF    ENDOFJOB

0418                        14,2174   00404 1  OCT404   OCT    404

04185                       14,2175   00264 1  1.8SEC   DEC    180

0419  REF   3  LAST  225   14,2176  0 5425 1  TERM52   TC     CLEARMRK

0421  REF 186  LAST  698   14,2177  0 4555 C            TC     BANKCALL      KILL MARK SYSTEM
0422  REF   6  LAST  588   14,2200   16063 C            CADR   MKRELEAS

0423  REF 141  LAST  686   14,2201  3 4714 1            CAF    ZERO
0424  REF   3  LAST  235   14,2202  55'323 C            TS     OPTCADR

0425  REF 187  LAST  698   14,2203  0 4555 C            TC     BANKCALL      CLEAR OUT EXTENDED VERBS
```

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0426  REF   3  LAST  561   14,2204   20464 0          CADR   KLEENEX

0427  REF  49  LAST  695   14,2205   0 4106 1         TC     GOTOPOOH        NOW GO TO POO

0428                        14,2206   43020 1  ADVORB  STQ    SET             SETS UP ADVANCED ORBIT TRACKING
0429  REF   4  LAST  697   14,2207   02576 1          SAVQR52
0430  REF   2  LAST  696   14,2210   04065 0          ADVTRK
0431                        14,2211   43014 0          SET    SET
0432  REF  17  LAST  694   14,2212   01463 1          LUNAFLAG
0433  REF   8  LAST  694   14,2213   00462 1          ERADFLAG
0434                        14,2214   77650 1          GOTO
0435  REF   1               14,2215   30005 1          R52VRB
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R0436   NAME -SSC ALIAS  LCCSAM
R0437   NAME- LCCSAM
R0438   FUNCTION -TO COMPUTE QUATITIES LISTED BELOW ,USED IN THE
R0439             IMU ALIGNMENT PROGRAMS
R0440   DEFINE:
R0441        RATT=POSITION VECTOR OF CM  WRT PRIMARY BODY
R0442        VATT=VELOCITY VECTOR OF CM  WRT PRIMARY BODY
R0443        RE  =RADIUS OF EARTH
R0444        RM  =RADIUS OF MOON
R0445        ECLIPOL= POLE OF ECLIPTIC SCALED BY TANGENTIAL VELOCITY OF EARTH
R0446                 WRT TO SUN  OVER  THE VELOCITY OF LIGHT
R0447        REM =POSITION OF MOON  WRT  EARTH
R0448        RES =POSITION OF SUN  WRT EARTH
R0449        C = VELOCITY OF LIGHT
R0450
R0451
R0452            EARTH IS PRIMARY                MOON IS PRIMARY
R0453                    -                               -
R0454            VEARTH=-1(RATT)                 VEARTH=-1(REM+RATT)
R0455
R0456                    -                               -
R0457            VMOON= 1(REM-RATT)              VMOON =-1(RATT)
R0458
R0459                    -                               -
R0460            VSUN = 1(RES)                   VSUN  =1(RES-REM)
R0461
R0462                          -1
R0463            CEARTH=COS(SIN (RE/RATT)+5)     CEARTH=COS 5
R0464
R0465                                                          -1
R0466            CMOON= COS 5                    CMOON=COS(SIN CRM/RATT)+5)
R0467
R0468
R0469            CSUN = COS 15                   CSUN = COS 15
R0470
R0471
R0472                         VEL/C = VSUN X ECLIPOL + VATT/C
R0473
R0474
R0475
R0476   CALL -   CLOAD  CALL
R0477                   DESIRED TIME
R0478                   LCCSAM
R0479   INPUTS - MPAC = TIME
R0480
R0481   OUTPUTS- VEARTH,VMOON,VSUN,CEARTH,CMOON,CSUN,VEL/C
R0482
R0483   SUBROUTINES- LSPOS,CSMCONIC
R0484
R0485   DEBRIS - VAC AREA,SEE SUBROUTINES
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R0486
 0487   REF   2  LAST  695   14,2000                    SETLOC P50S1
 0488                       14,2216                    BANK

 0489   REF   1                                        COUNT* $$/S50

 0490   REF   1             14,2216          LOCSAM    =      S50
 0491                       14,2216  77620 C S50       STQ
 0492   REF   4  LAST  695   14,2217  00300 1                  QMAJ
 0493   REF   7  LAST  695   14,2220  36607 C           STCALL TSIGHT
 0494   REF   1             14,2221  54110 C                  LSPOS
 0495   REF   2  LAST   92   14,2222  26752 C           STOVL  VMOON
 0496                       14,2223  00003 1                  2D
 0497   REF   2  LAST   92   14,2224  16744 1           STODL  VSUN
 0498   REF   8  LAST  701   14,2225  02607 1                  TSIGHT
 0499   REF  39  LAST  695   14,2226  34041 C           STCALL TDEC1
 0500   REF   5  LAST  584   14,2227  27045 C                  CSMCONIC
 0501                       14,2230  61131 C           SSP    TIX,2
 0502   REF  10  LAST  622   14,2231  00052 C                  S2
 0503                       14,2232  00000 1                  0
 0504   REF   1             14,2233  30256 C                  MOONCNTR
 0505                       14,2234  52375 1 EARTCNTR  VLOAD  VSU
 0506   REF   3  LAST  701   14,2235  02752 C                  VMOON
 0507   REF  23  LAST  695   14,2236  00001 C                  RATT
 0508                       14,2237  77656 1           UNIT
 0509   REF   4  LAST  701   14,2240  26752 C           STOVL  VMOON
 0510   REF  24  LAST  701   14,2241  00001 C                  RATT
 0511                       14,2242  57456 1           UNIT   VCOMP
 0512   REF   3  LAST   92   14,2243  16736 1           STODL  VEARTH
 0513   REF   1             14,2244  32162 C                  RSUBE
 0514                       14,2245  77624 1           CALL
 0515   REF   1             14,2246  30316 C                  OCCOS
 0516   REF   1             14,2247  14017 1           STODL  CEARTH
 0517   REF   1             14,2250  32200 1                  CSS5
 0518   REF   1             14,2251  24023 C           STOVL  CMOON
 0519   REF   3  LAST  701   14,2252  02744 1                  VSUN
 0520                       14,2253  77656 1           UNIT
 0521   REF   4  LAST  701   14,2254  36744 C           STCALL VSUN
 0522   REF   1             14,2255  30303 1                  ENDSAM
 0523                       14,2256  40575 1 MOONCNTR  VLOAD  VSR8
 0524   REF   5  LAST  701   14,2257  02752 C                  VMOON
 0525                       14,2260  51362 1           VSR1   BVSU
 0526   REF   5  LAST  701   14,2261  02744 1                  VSUN
 0527                       14,2262  77656 1           UNIT
 0528   REF   6  LAST  701   14,2263  26744 1           STOVL  VSUN
 0529   REF   6  LAST  701   14,2264  02752 C                  VMOON
 0530                       14,2265  53455 C           VAD    UNIT
 0531   REF  25  LAST  701   14,2266  00001 C                  RATT
 0532                       14,2267  77676 C           VCOMP
 0533   REF   4  LAST  701   14,2270  26736 1           STOVL  VEARTH
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0534   REF  26  LAST  701   14,2271   00001 0                 RATT
0535                       14,2272   57456 1          UNIT   VCOMP
0536   REF   7  LAST  701   14,2273   16752 0          STODL  VMOON
0537   REF   1              14,2274   32160 1                 RSUBM
0538                       14,2275   77624 1          CALL
0539   REF   2  LAST  701   14,2276   30316 0                 OCCOS
0540   REF   2  LAST  701   14,2277   14023 0          STODL  CMOON
0541   REF   2  LAST  701   14,2300   32200 1                 CSS5
0542   REF   2  LAST  701   14,2301   24017 1          STOVL  CEARTH
0543   REF   7  LAST  701   14,2302   02744 1                 VSUN
0544                       14,2303   77635 1  ENDSAM  VXV
0545   REF   1              14,2304   32170 0                 ECLIPOL
0546   REF   2  LAST  114   14,2305   27474 0          STOVL  VEL/C
0547   REF  19  LAST  695   14,2306   00007 0                 VATT
0548                       14,2307   53361 0          VXSC   VAD
0549   REF   1              14,2310   32166 1                 1/C
0550   REF   3  LAST  702   14,2311   03474 0                 VEL/C
0551   REF   4  LAST  702   14,2312   17474 0          STODL  VEL/C
0552   REF   1              14,2313   32202 0                 CSSUN
0553   REF   1              14,2314   34021 0          STCALL CSUN
0554   REF   5  LAST  701   14,2315   00300 1                 QMAJ
0555                       14,2316   70471 1  OCCOS   DDV    SR1
0556                       14,2317   00045 0                 36D
0557                       14,2320   43336 0          ASIN   DAD
0558   REF   1              14,2321   32164 0                 5DEGREES
0559                       14,2322   70546 1          COS    SR1
0560                       14,2323   77616 0          RVQ
0561   REF   2  LAST  691  15,2000                     SETLOC P50S
0562                       15,2157                     BANK
0563                       15,2157   00065 1  RSUBM   2DEC   1738090 B-29    MOON RADIUS IN METERS
0563                       15,2160   01265 1
0564                       15,2161   00302 0  RSUBE   2DEC   6378166 B-29
0564                       15,2162   24533 1
0565                       15,2163   00343 0  5DEGREES 2DEC  .013888889      SCALED IN REVS
0565                       15,2164   21616 0
0566                       15,2165   00000 1  1/C     2DEC   .000042699 B-1  *
0566                       15,2166   13143 0
0567                       15,2167   00000 1  ECLIPOL 2DEC   0               *
0567                       15,2170   00000 1
0568                       15,2171   77777 0          2DEC   -.00007896 B-1  *
0568                       15,2172   53231 1
0569                       15,2173   00001 0          2DEC   .00018209 B-1   *          * FOR USE BY CSM ONLY
0569                       15,2174   17570 0
0570                       15,2175   00001 0  TSIGHT1 2DEC   24000
0570                       15,2176   16700 1
0571                          0016           CEARTH  =      14D
0572                          0020           CSUN    =      16D
0573                          0022           CMOON   =      18D
0574                       15,2177   07760 1  CSS5    2DEC   .2490475        (COS 5)/4
0574                       15,2200   14473 1
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0575                    15,2201   07564 1  CSSUN    2DEC    .24148          COS 15  /4
0575                    15,2202   15042 0
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R0576   PROGRAM NAME - PICAPAR          DATE DEC 20 66
R0577   MOD 1                          LOG SECTION P51-P53
R0578                                  ASSEMBLY  SUNDISK  REV40
R0579   BY KEN VINCENT
R0580
R0581   FUNCTION
R0582     THIS PROGRAM READ THE IMU-CDUS AND COMPUTES THE VEHICLE ORIENTATION
R0583   WITH RESPECT TO INERTIAL SPACE. IT THEN COMPUTES THE SHAFT AXIS (SAX)
R0584   WITH RESPECT TO REFERENCE INERTIAL. EACH STAR IN THE CATALOG IS TESTED
R0585   TO DETERMINE IF IT IS OCCULTED BY EITHER THE EARTH,SUN OR MOON. IF A
R0586   STAR IS NOT OCCULTED  THEN IT IS PAIRED WITH ALL STAR OF LOWER INDEX.
R0587   THE PAIRED STAR  IS TESTED FOR OCCULTATION. PAIRS OF STARS THAT PASS
R0588   THE OCCULTATION TESTS ARE TESTED FOR GOOD SEPARATION.A PAIR OF STARS
R0589   HAVE GOOD SEPARATION IF THE ANGLE BETWEEN THEM IS LESS THAN 66DEGREES
R0590   AND MORE THAN 40DEGREES. THOSE PAIRS OF STARS WITH GOOD SEPARATION
R0591   ARE THEN TESTED TO SEE IF THEY LIE IN CURRENT FIELD OF VIEW.(WITHIN
R0592   33DEGREES OF SAX). THE PAIR WITH MAXIMUM SEPARATION IS CHOSEN FROM
R0593   THOSE WITH GOOD SEPARATION,AND     IN FIELD OF VIEW.
R0594
R0595   CALLING SEQUENCE
R0596   L       TC      BANKCALL
R0597   L+1     CADR    PICAPAR
R0598   L+2     ERROR RETURN - NO STARS IN FIELD OF VIEW
R0599   L+3     NORMAL RETURN
R0600
R0601   OUTPUT
R0602   BESTI,BESTJ -SINGLE PREC,INTEGERS,STAR NUMBERS TIMES 6
R0603   VFLAG - FLAG BIT  SET IMPLIES NO STARS IN FIELD OF VIEW
R0604
R0605   INITIALIZATION
R0606   1)A CALL TO LOCSAM MUST BE MADE
R0607   2)VEARTH = -UNIT(R)  WHERE R HAS BEEN UPDATED TOO APPROXIMATE TIME OF
R0608        SIGHTINGS.
R0609
R0610   DEBRIS
R0611   WORK AREA
R0612   X,Y,ZAB
R0613   SINCDU,COSCDU
R0614   STARAD - STAR +5
 0615   REF   1                                          COUNT  14/PICAP

 0616   REF   3  LAST  701   14,2000                    SETLOC P50S1
 0617                        14,2324                    BANK
 0618   REF   3  LAST  562   14,2324  0 4604 1  PICAPAR  TC     MAKECADR
 0619   REF   3  LAST  552   14,2325  55*777 0          TS     QMIN
 0620   REF 168  LAST  698   14,2326  0 6006 1          TC     INTPRET
 0621                        14,2327   77624 1          CALL
 0622   REF   6  LAST  670   14,2330   47432 1                 CDUTRIG
 0623                        14,2331   77624 1          CALL
 0624   REF   1              14,2332   34567 1                 CALCSMSC
```

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0625                          14,2333  77601 C          SETPD
0626                          14,2334  C0001 C                   0
0627                          14,2335  71214 C          SET      DLOAD          VFLAG = 1
0628  REF   1                 14,2336  01465 1                   VFLAG
0629  REF   1                 14,2337  11453 C                   DPZERO
0630  REF   8  LAST  609      14,2340  24303 1          STOVL    BESTI
0631  REF   4  LAST  422      14,2341  02714 1                   XNB
0632                          14,2342  63361 C          VXSC     PDVL
0633  REF   1                 14,2343  30502 C                   SIN33
0634  REF   4  LAST  415      14,2344  02730 1                   ZNB
0635                          14,2345  74370 C          AXT,1    VXSC
0636                          14,2346  00344 1                   228D           X1 = 37 X 6 +6
0637  REF   1                 14,2347  30504 C                   COS33
0638                          14,2350  77655 1          VAD
0639                          14,2351  53505 1          VXM      UNIT
0640  REF  21  LAST  674      14,2352  01736 1                   REFSMMAT
0641  REF   1                 14,2353  02760 1          STORE    SAX            SAX = SHAFT AXIS
0642                          14,2354  66331 C          SSP      SSP            S1=S2=6
0643  REF  25  LAST  634      14,2355  C0051 C                   S1
0644                          14,2356  00006 1                   6
0645  REF  11  LAST  701      14,2357  00052 C                   S2
0646                          14,2360  00006 1                   6
0647                          14,2361  52100 1  PIC1    TIX,1    GOTO           MAJOR STAR
0648  REF   1                 14,2362  30364 C                   PIC2
0649  REF   1                 14,2363  30513 C                   PICEND
0650                          14,2364  45173 C  PIC2    VLOAD*   CALL
0651  REF   2  LAST  620      14,2365  31751 C                   CATLOG,1
0652  REF   1                 14,2366  30457 1                   OCCULT
0653                          14,2367  73014 C          BON      LXA,2
0654  REF   4  LAST  281      14,2370  01710 C                   CULTFLAG
0655  REF   1                 14,2371  30361 C                   PIC1
0656  REF  31  LAST  673      14,2372  00046 C                   X1
0657                          14,2373  52104 C  PIC3    TIX,2    GOTO
0658  REF   1                 14,2374  30376 C                   PIC4
0659  REF   2  LAST  705      14,2375  30361 C                   PIC1
0660                          14,2376  45173 C  PIC4    VLOAD*   CALL
0661  REF   3  LAST  705      14,2377  46026 1                   CATLOG,2
0662  REF   2  LAST  705      14,2400  30457 1                   OCCULT
0663                          14,2401  76614 C          BON      VLOAD*
0664  REF   5  LAST  705      14,2402  01710 C                   CULTFLAG
0665  REF   1                 14,2403  30373 C                   PIC3
0666  REF   4  LAST  705      14,2404  31751 C                   CATLOG,1
0667                          14,2405  45237 C          DOT*     DSU
0668  REF   5  LAST  705      14,2406  46026 1                   CATLOG,2
0669  REF   1                 14,2407  30506 1                   CSS66          SEPERATION LESS THAN 66 DEG.
0670                          14,2410  43240 C          BMN      DAD
0671  REF   2  LAST  705      14,2411  30373 C                   PIC3
0672  REF   1                 14,2412  30510 C                   CSS6640        SEPERATION MORE THAN 40 DEG.
0673                          14,2413  77644 1          BPL
0674  REF   3  LAST  705      14,2414  30373 C                   PIC3
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0675                          14,2415  50373 C          VLOAD* DOT
0676  REF   6 LAST  705      14,2416  31751 C                 CATLOG,1
0677  REF   2 LAST  705      14,2417  02760 1                 SAX
0678                          14,2420  50025 C          DSU    BMN          MAJOR STAR IN CONE
0679  REF   1                 14,2421  30512 1                 CSS33
0680  REF   3 LAST  705      14,2422  30361 C                 PIC1
0681                          14,2423  50373 C          VLOAD* DOT
0682  REF   7 LAST  706      14,2424  46026 1                 CATLOG,2
0683  REF   3 LAST  706      14,2425  02760 1                 SAX
0684                          14,2426  51025 1          DSU    BPL
0685  REF   2 LAST  706      14,2427  30512 1                 CSS33
0686  REF   1                 14,2430  30433 C                 STRATGY
0687                          14,2431  77650 1          GOTO
0688  REF   4 LAST  705      14,2432  30373 C                 PIC3
0689                          14,2433  77614 1  STRATGY BONCLR
0690  REF   2 LAST  705      14,2434  01605 C                 VFLAG
0691  REF   1                 14,2435  30452 1                 NEWPAR
0692                          14,2436  65120 1          XCHX,1 XCHX,2
0693  REF   9 LAST  705      14,2437  00302 C                 BESTI
0694  REF   2 LAST   69       14,2440  00303 1                 BESTJ
0695                          14,2441  47773 1  STRAT  VLOAD* DOT*
0696  REF   8 LAST  706      14,2442  31751 C                 CATLOG,1
0697  REF   9 LAST  706      14,2443  46026 1                 CATLOG,2
0698                          14,2444  43006 C          PUSH   BOFINV
0699  REF   3 LAST  706      14,2445  01545 1                 VFLAG
0700  REF   1                 14,2446  30436 C                 STRAT -3
0701                          14,2447  45345 1          DLOAD  DSU
0702                          14,2450  77644 1          BPL
0703  REF   5 LAST  706      14,2451  30373 C                 PIC3
0704                          14,2452  67130 1  NEWPAR  SXA,1  SXA,2
0705  REF  10 LAST  706      14,2453  00302 C                 BESTI
0706  REF   3 LAST  706      14,2454  00303 1                 BESTJ
0707                          14,2455  77650 1          GOTO
0708  REF   6 LAST  706      14,2456  30373 C                 PIC3
0709                          14,2457  51321 C  OCCULT  MXV    BVSU
0710  REF   1                 14,2460  02736 1                 CULTRIX
0711  REF   1                 14,2461  00017 1                 CSS
0712                          14,2462  77654 C          BZE
0713  REF   1                 14,2463  30476 1                 CULTED
0714                          14,2464  75240 C          BMN    SIGN
0715  REF   2 LAST  706      14,2465  30476 1                 CULTED
0716  REF 272 LAST  68C       14,2466  00160 C                 MPAC +3
0717                          14,2467  75240 C          BMN    SIGN
0718  REF   3 LAST  706      14,2470  30476 1                 CULTED
0719  REF 273 LAST  706      14,2471  00162 1                 MPAC +5
0720                          14,2472  43040 1          BMN    CLRGO
0721  REF   4 LAST  706      14,2473  30476 1                 CULTED
0722  REF   6 LAST  705      14,2474  01630 0                 CULTFLAG
0723  REF  13 LAST  622       14,2475  00052 C                 QPRET
0724                          14,2476  77614 1  CULTED  SETGO
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0725   REF   7  LAST  706   14,2477   01430 1                    CULTFLAG
0726   REF  14  LAST  706   14,2500   00052 0                    QPRET
0727   REF   3  LAST  702      0016             CSS      =      CEARTH
0728                        14,2501   21150 0   SIN33    2DEC   .5376381241
0728                        14,2502   25157 0
0729                        14,2503   32766 1   COS33    2DEC   .8431756920
0729                        14,2504   22713 1
0730                        14,2505   01736 1   CSS66    2DEC   .060480472     (COS76)/4
0730                        14,2506   35137 1
0731                        14,2507   73003 0   CSS6640  2DEC   -.15602587     (COS76 - COS30)/4
0731                        14,2510   65403 0
0732                        14,2511   06233 0   CSS33    2DEC   .197002688     COS(1/2(76))/4
0732                        14,2512   26112 1
0733                        14,2513   77414 0   PICEND   BOFF   EXIT
0734   REF   4  LAST  706   14,2514   01745 0                    VFLAG
0735   REF   1              14,2515   30517 1                    PICGXT
0736   REF   1              14,2516   0 2521 0          TC       PICBXT
0737                        14,2517   77776 1   PICGXT   EXIT
0738   REF   4  LAST  704   14,2520   25'777 1          INCR     QMIN
0739   REF   5  LAST  707   14,2521   3 1777 1  PICBXT  CA       QMIN
0740   REF   3  LAST  411   14,2522   0 4561 1          TC       SWCALL
A0741                                          V1       =      12D
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P0742   NAME-R51  FINE ALIGN
R0743   FUNCTION-TO ALIGN THE STABLE MEMBER TO REFSMMAT
R0744   CALLING SEQ- CALL  R51
R0745   INPUT- BESTI,BESTJ(PAIR OF STAR NO )
R0746   OUTPUT- GYRO TORQUE PULSES
R0747   SUBROUTINES- R52,R54,R55(SXTNB,NBSM,AXISGEN
 0748   REF   1                                                  COUNT  14/R51

 0749                              14,2523   77776 1  R51      EXIT
 0750   REF  56  LAST  692         14,2524  3 4712 1           CAF    BIT1
 0751   REF   4  LAST  608         14,2525  54 304 1           TS     STARIND
 0752   REF   5  LAST  608         14,2526  54 301 1           TS     MARKINDX
 0753   REF 169  LAST  704         14,2527  0 6006 1  R51.2    TC     INTPRET
 0754                              14,2530   43014 0  R51.3    CLEAR  CLEAR
 0755   REF   3  LAST  608         14,2531   00666 1           CLEAR  TARG2FLG
 0756   REF   6  LAST  696         14,2532   00665 1           CLEAR  TARG1FLG
 0757                              14,2533   77776 1           EXIT
 0758   REF  65  LAST  692         14,2534  0 5301 0           TC     PHASCHNG
 0759                              14,2535   05024 1           OCT    05024          RESTART  GR 4  FOR R52 - R53
 0760                              14,2536   13000 0           OCT    13000
 0761   REF   5  LAST  708         14,2537  50 304 0           INDEX  STARIND
 0762   REF  11  LAST  706         14,2540  3 0302 0           CA     BESTI
 0763                              14,2541  0 0006 1           EXTEND
 0764   REF   1                    14,2542  7 2706 0           MP     1/6TH
 0765   REF   6  LAST  609         14,2543  54 735 1           TS     STARCODE
 0766   REF   1                    14,2544  3 2705 1           CAF    VOIN70
 0767   REF 188  LAST  698         14,2545  0 4555 0           TC     BANKCALL
 0768   REF  15  LAST  658         14,2546   20763 1           CADR   GOFLASHR
 0769   REF  50  LAST  699         14,2547  0 4106 1           TC     GOTOPOOH
 0770                              14,2550  0 2555 0           TC     +5
 0771                              14,2551  0 2544 0           TC     -5
 0772   REF  24  LAST  646         14,2552  3 6211 0           CAF    SIX
 0773   REF  13  LAST  615         14,2553  0 5415 1           TC     BLANKET
 0774   REF  93  LAST  698         14,2554  1 5112 1           TCF    ENDOFJOB
 0775   REF 170  LAST  708         14,2555  0 6006 1           TC     INTPRET
 0776                              14,2556   45034 1           RTB    CALL
 0777   REF  20  LAST  693         14,2557   45505 0                  LOADTIME
 0778   REF   1                    14,2560   32363 0                  PLANET
 0779                              14,2561   72131 1           SSP    LXA,1
 0780   REF  26  LAST  705         14,2562   00051 0                  S1
 0781                              14,2563   00000 1                  0
 0782   REF   6  LAST  708         14,2564   00304 0                  STARIND
 0783                              14,2565   77700 0           TIX,1
 0784   REF   1                    14,2566   30571 1                  R51ST
 0785   REF   3  LAST  609         14,2567   36617 1           STCALL STARSAV2       2ND STAR
 0786   REF   2  LAST  708         14,2570   30572 1                  R51ST +1
 0787   REF   2  LAST   90         14,2571   02611 0  R51ST    STORE  STARSAV1       1ST STAR
 0788                              14,2572   77776 1           EXIT
 0789   REF  12  LAST  641         14,2573  4 1011 1           CS     MODREG         IS THIS P54
 0790   REF   1                    14,2574  6 2704 0           AD     OCT66
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0791                                14,2575  0 0006 1          EXTEND
0792  REF   1                      14,2576  1 2677 1          BZF     R51B          YES
0793  REF 171  LAST  708           14,2577  0 6006 1          TC      INTPRET
0794                                14,2600  77624  1          CALL
0795  REF   4  LAST  611           14,2601  30002  0                  R52           AOP WILL MAKE CALLS TO SIGHTING
0796                                14,2602  77624  1  R51A    CALL                  COMPUTE LOS IN SM FROM MARK DATA
0797  REF   1                      14,2603  31273  0                  SXTSM
0798  REF   4  LAST  708           14,2604  02617  0          STORE   STARSAV2
0799                                14,2605  77776  1          EXIT
0800  REF 189  LAST  708           14,2606  0 4555 0          TC      BANKCALL
0801  REF   7  LAST  698           14,2607  16063  0          CADR    MKRELEAS
0802  REF 172  LAST  709           14,2610  0 6006 1          TC      INTPRET
0803                                14,2611  45145  0          DLOAD   CALL
0804  REF   9  LAST  701           14,2612  02607  1                  TSIGHT
0805  REF   2  LAST  708           14,2613  32363  0                  PLANET
0806                                14,2614  77776  1          EXIT
0807  REF   7  LAST  708           14,2615  10 304 1          CCS     STARIND
0808  REF   1                      14,2616  0 2664 1          TC      R51.4
0809  REF 173  LAST  709           14,2617  0 6006 1          TC      INTPRET
0810                                14,2620  53521  1          MXV     UNIT
0811  REF  22  LAST  705           14,2621  01736  1                  REFSMMAT
0812  REF   5  LAST  441           14,2622  02736  1          STORE   STARAD
0813                                14,2623  77776  1          EXIT
0814  REF  66  LAST  708           14,2624  0 5301 0          TC      PHASCHNG
0815                                14,2625  05024  1          OCT     05024         RESTART THIS GROUP 4  JOB
0816                                14,2626  13000  0          OCT     13000          WITH PRIORITY  13
0817  REF 174  LAST  709           14,2627  0 6006 1          TC      INTPRET
0818                                14,2630  77775  1          VLOAD
0819  REF   5  LAST  709           14,2631  02617  0                  STARSAV2
0820                                14,2632  24007  0          STOVL   6D
0821  REF   3  LAST  708           14,2633  02611  0                  STARSAV1
0822                                14,2634  24015  0          STOVL   12D
0823  REF   2  LAST   90           14,2635  02601  1                  PLANVEC
0824  REF   6  LAST  709           14,2636  36744  0          STCALL  STARAD +6
0825  REF   1                      14,2637  30707  1                  R54           STAR DATA TEST
0826                                14,2640  45014  0          BOFF    CALL
0827  REF   1                      14,2641  00354  0                  FREEFLAG
0828  REF   1                      14,2642  30650  1                  R51K
0829  REF   2  LAST  442           14,2643  47334  0                  AXISGEN
0830                                14,2644  77624  1          CALL
0831  REF   1                      14,2645  32203  1                  R55           GYRO TORQUE
0832                                14,2646  77614  1          CLEAR
0833  REF   2  LAST  637           14,2647  01273  0                  PFRATFLG
0834                                14,2650  77776  1  R51K    EXIT
0835  REF   2  LAST  154           14,2651  3 5660 1          CAF     OCT14
0836  REF 190  LAST  709           14,2652  0 4555 0          TC      BANKCALL
0837  REF   4  LAST  693           14,2653  20751  0          CADR    GOPERF1
0838  REF  51  LAST  708           14,2654  0 4106 1          TC      GOTOPOOH
0839                                14,2655  0 2657 1          TC      +2            V33
0840                                14,2656  0 2661 1          TC      +3
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0841  REF 151  LAST  709   14,2657  0 4555 C          TC      BANKCALL
0842  REF   3  LAST  694   14,2660   32120 C          CADR    P52C
0843  REF 175  LAST  709   14,2661  0 6006 1          TC      INTPRET
0844                       14,2662   77650 1          GOTO
0845  REF   1              14,2663   32143 C                  ENDP50S
0846  REF 176  LAST  710   14,2664  0 6006 1  R51.4   TC      INTPRET
0847                       14,2665   53521 1          MXV     UNIT
0848  REF  23  LAST  709   14,2666   01736 1                  REFSMMAT
0849  REF   3  LAST  709   14,2667   26601 1          STOVL   PLANVEC
0850  REF   6  LAST  709   14,2670   02617 C                  STARSAV2
0851  REF   4  LAST  709   14,2671   02611 C          STORE   STARSAV1
0852                       14,2672   77731 1          SSP
0853  REF   8  LAST  709   14,2673   00305 1                  STARIND
0854                       14,2674   00000 1                  0
0855                       14,2675   77650 1          GOTO
0856  REF   1              14,2676   30530 1                  R51.3
0857  REF 177  LAST  710   14,2677  0 6006 1  R51B    TC      INTPRET
0858                       14,2700   77624 1          CALL
0859  REF   1              14,2701   32252 0                  R56
0860                       14,2702   77650 1          GOTO
0861  REF   1              14,2703   30602 C                  R51A
0862                       14,2704   00066 1  OCT66   OCT     00066
0863                       14,2705   00306 1  V01N70  VN      0170
0864                       14,2706   05253 C  1/6TH   DEC     .1666667
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R0865   NAME-R55  GYRO TORQUE
R0866   FUNCTION-COMPUTE AND SEND GYRO PULSES
R0867   CALLING SEQ- CALL R55
R0868   INPUT- X,Y,ZOC- REFSMMAT WRT PRESENT STABLE MEMBER
R0869   OUTPUT- GYRO PULSES
R0870   SUBROUTINES- CALCGTA,GOFLASH,GOTOPOOH,IMUFINE,IMUPULSE,GOPERF1
 08705  REF   3  LAST  702   15,2000                        SETLOC P50S
 0871                        15,2203                        BANK
 08715  REF   1                                            COUNT* $$/R55
 0872                        15,2203   77620 0  R55        STQ
 0873   REF   6  LAST  707   15,2204   02777 1             QMIN
 0874                        15,2205   77624 1             CALL
 0875   REF   3  LAST  532   15,2206   47140 1             CALCGTA
 0876                        15,2207   77776 1  PULSEM     EXIT
 0877   REF   1              15,2210   3 2234 0 R55.1      CAF     V06N93
 0878   REF 192  LAST  710   15,2211   0 4555 0            TC      BANKCALL
 0879   REF  32  LAST  695   15,2212    20624 0            CADR    GOFLASH
 0880   REF  52  LAST  709   15,2213   0 4106 1            TC      GOTOPOOH
 0881   REF   1              15,2214   0 2216 0            TC      R55.2
 0882   REF   1              15,2215   0 2231 0            TC      R55RET
 0883   REF  67  LAST  709   15,2216   0 5301 0 R55.2      TC      PHASCHNG
 0884                        15,2217    00314 1            OCT     00314
 0885   REF   1              15,2220   3 2235 1            CA      R55CDR
 0886   REF 193  LAST  711   15,2221   0 4555 0            TC      BANKCALL
 0887   REF   5  LAST  437   15,2222    17125 1            CADR    IMUPULSE
 0888   REF 194  LAST  711   15,2223   0 4555 0            TC      BANKCALL
 0889   REF   8  LAST  437   15,2224    17516 0            CADR    IMUSTALL
 0890   REF   1              15,2225   0 5646 0            TC      CURTAINS
 0891   REF  68  LAST  711   15,2226   0 5301 0            TC      PHASCHNG
 0892                        15,2227    05024 1            OCT     05024
 0893                        15,2230    13000 0            OCT     13000
 0894   REF 178  LAST  710   15,2231   0 6006 1 R55RET     TC      INTPRET
 0895                        15,2232    77650 1            GOTO
 0896   REF   7  LAST  711   15,2233    02777 1             QMIN
 0897                        15,2234    01535 0 V06N93      VN      0693
 0898   REF  16  LAST  533   15,2235    02757 0 R55CDR      ECADR   OGC
 0899   REF   1              14,2707           R54          =       CHKSDATA
R0900   ROUTINE NAME- CHKSDATA                                    DATE- JAN 9, 1967
R0902   MOD NO- 0                                                 LOG SECTION- P51-P53
R0904   MODIFICATION BY- LONSKE                                   ASSEMBLY-

R0906   FUNCTIONAL DESCRIPTION - CHECKS THE VALIDITY OF A PAIR OF STAR SIGHTINGS. WHEN A PAIR OF STAR SIGHTINGS ARE MADE
R0908   BY THE ASTRONAUT THIS ROUTINE OPERATES AND CHECKS THE OBSERVED SIGHTINGS AGAINST STORED STAR VECTORS IN THE
R0910   COMPUTER TO INSURE A PROPER SIGHTING WAS MADE. THE FOLLOWING COMPUTATIONS ARE PERFORMED_

R0912                   OS1 = OBSERVED STAR 1 VECTOR
R0913                   OS2 = OBSERVED STAR 2 VECTOR
R0914                   SS1 = STORED STAR 1 VECTOR
R0915                   SS2 = STORED STAR 2 VECTOR
R0916                    A1 = ARCCOS(OS1 - OS2)
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R0917                    A2 = ARCCOS(SS1 - SS2)
R0918                     A = ABS(2(A1 - A2))

R0919   THE ANGULAR DIFFERENCE IS DISPLAYED FOR ASTRONAUT ACCEPTENCE
R0920   EXIT MODE 1. FREEFLAG SET  IMPLIES  ASTRONAUT WANTS TO PROCEED
R0921              2. FREEFLAG RESET IMPLIES ASTRONAUT WANTS TO RECYCLE          ERANCE)
R0923   OUTPUT - 1.VERB 6,NOUN 3- DISPLAYS ANGULAR DIFFERENCE BETWEEN 2 SETS OF STARS.
R0925            2.STAR VECTORS FROM STAR CATALOG ARE LEFT IN 6D AND 12D.

R0926   ERASABLE INITIALIZATION REQUIRED -
R0927            1.MARK VECTORS ARE STORED IN STARAD AND STARAD +6.
R0928            2.CATALOG VECTORS ARE STORED IN 6D AND 12D.
R0929   DEBRIS -
 09295  REF   4  LAST  704   14,2000                        SETLOC P50S1
 0930                         14,2707                        BANK
 09305  REF   1                                             COUNT* $$/R50
 0931                         14,2707   43020 1  CHKSDATA  STQ     SET
 0932   REF   8  LAST  711   14,2710   02777 1               QMIN
 0933   REF   2  LAST  709   14,2711   00074 1               FREEFLAG
 0934                         14,2712   77760 0  CHKSAB    AXC,1                  SET X1 TO STORE  EPHEMERIS DATA
 0935   REF   7  LAST  709   14,2713   02735 1               STARAD
R0936
 0937                         14,2714   47773 1  CHKSB     VLOAD*  DOT*          CAL. ANGLE THETA
 0938                         14,2715   00001 0                 0,1
 0939                         14,2716   00007 0                 6,1
 0940                         14,2717   65552 0           SL1   ACOS
 0941   REF   1               14,2720   00025 0           STORE THETA
 0942                         14,2721   43014 0           BOFF  INVERT           BRANCH TO CHKSD IF THIS IS 2ND PASS
 0943   REF   3  LAST  712   14,2722   00354 0                 FREEFLAG
 0944   REF   1               14,2723   30733 0                 CHKSD
 0945   REF   4  LAST  712   14,2724   00174 0                 FREEFLAG       CLEAR FREEFLAG
 0946                         14,2725   71360 1           AXC,1 DLOAD          SET X1 TO MARK ANGLES
 0947                         14,2726   00006 1                 6D
 0948   REF   2  LAST  712   14,2727   00025 0                 THETA
 0949                         14,2730   00023 0           STORE 18D
 0950                         14,2731   77650 1           GOTO
 0951   REF   1               14,2732   30714 0                 CHKSB          RETURN TO CAL. 2ND ANGLE
 0952                         14,2733   45345 1  CHKSD     DLOAD DSU
 0953   REF   3  LAST  712   14,2734   00025 0                 THETA
 0954                         14,2735   00023 0                 18D            COMPUTE POS DIFF
 0955                         14,2736   47046 0           ABS   RTB
 0956   REF   3  LAST  493   14,2737   45541 0                 SGNAGREE
 0957   REF   1               14,2740   01046 1           STORE NORMTEM1
 0958                         14,2741   77414 0           SET   EXIT
 0959   REF   5  LAST  712   14,2742   00074 1                 FREEFLAG
 09594  REF 142  LAST  698   14,2743   3 4714 1          CAF   ZERO
 09595  REF 195  LAST  711   14,2744   0 4555 0          TC    BANKCALL
 09596  REF   5  LAST  639   14,2745    20607 1          CADR  CLEANDSP

 0960   REF   1               14,2746   3 2762 0          CAF   VB6N5
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 0961   REF 156  LAST  712   14,2747   0 4555 C            TC      BANKCALL
 0962   REF  33  LAST  711   14,2750    20624 C            CADR    GOFLASH
 0963   REF  53  LAST  711   14,2751   1 4106 C            TCF     GOTOPOOH
 0964   REF   1              14,2752   0 2757 C            TC      CHKSDA          PROCEED
 0965   REF 179  LAST  711   14,2753   0 6006 1            TC      INTPRET
 0966                        14,2754    52014 C            CLEAR   GOTO
 0967   REF   6  LAST  712   14,2755    00274 C                    FREEFLAG
 0968   REF   9  LAST  712   14,2756    02777 1                    QMIN
 0969   REF 180  LAST  713   14,2757   0 6006 1  CHKSDA    TC      INTPRET
 0970                        14,2760    77650 1            GOTO
 0971   REF  10  LAST  713   14,2761    02777 1                    QMIN
 0972                        14,2762    01405 1  VB6N5     VN      605
R0973   NAME - CAL53A
R0974   NAME - CAL53A
R0975   FUNCTION - COARSE ALIGN THE IMU, IF NECESSARY.
R0976   CALLING SEQUENCE - CALL CAL53A
R0977   INPUT -  PRESENT GIMBAL ANGLES - COUX,COUY,COUZ
R0978            DESIRED GIMBAL ANGLES - THETAD,+1,+2
R0979   OUTPUT - THE IMU COORDINATES ARE STORED IN REFSMMAT
R0980   SUBROUTINES USED - 1.IMUCOARS 2.IMUSTALL 3.CURTAINS
 0981   REF   2 LAST  712 TC  713:    44    44*           COUNT   14/R50

 0982                        14,2763    45020 1  CAL53A    STQ     CALL
 0983                        14,2764    00035 1                    29D
 0984   REF   2  LAST  693   14,2765    22256 C                    S52.2           MAKE FINAL COMP OF GIMBAL ANGLES
 0985                        14,2766    66234 1            RTB     SSP
 0986   REF   1              14,2767    32236 1                    RDCDUS          READ CDUS
 0987   REF  27  LAST  708   14,2770    00051 C                    S1
 0988                        14,2771    00001 C                    1
 0989                        14,2772    40370 1            AXT,1   SETPD
 0990                        14,2773    00003 1                    3
 0991                        14,2774    00005 1                    4
 0992                        14,2775    70543 1  CALCOP    DLOAD*  SR1
 0993   REF  16  LAST  585   14,2776    01161 C                    THETAD +3D,1
 0994                        14,2777    70523 1            PDDL*   SR1
 0995                        14,3000    00005 1                    4,1
 0996                        14,3001    51425 C            DSU     ABS
 0997                        14,3002    45206 1            PUSH    DSU
 0998   REF   1              14,3003    31060 C                    DEGREE1
 0999                        14,3004    71240 1            BMN     DLOAD
 1000   REF   1              14,3005    31034 1                    CALCOP1
 1001                        14,3006    51025 1            DSU     BPL
 1002   REF   1              14,3007    31061 1                    DEG359
 1003   REF   2  LAST  713   14,3010    31034 1                    CALCOP1
 1004                        14,3011    77776 1  COARFINE  EXIT
 1005   REF 197  LAST  713   14,3012   0 4555 C            TC      BANKCALL
 1006   REF   4  LAST  419   14,3013    16602 1            CADR    IMUCOARS        PERFORM COARSE ALIGNMENT
 1007   REF 198  LAST  713   14,3014   0 4555 C            TC      BANKCALL
 1008   REF   9  LAST  711   14,3015    17516 C            CADR    IMUSTALL        REQUEST MODE SWITCH
 1009   REF   2  LAST  711   14,3016   0 5646 C            TC      CURTAINS
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1010  REF 199  LAST 713   14,3017  0 4555 C          TC      BANKCALL
1011  REF   1              14,3020   17012 1          CADR    IMUFIN20
1012  REF 200  LAST 714    14,3021  0 4555 C          TC      BANKCALL
1013  REF  10  LAST 713    14,3022   17516 C          CADR    IMUSTALL
1014  REF   3  LAST 713    14,3023  0 5646 C          TC      CURTAINS      TEST FOR MALFUNCTION
1015  REF 181  LAST 713    14,3024  C 6006 1          TC      INTPRET
1016                        14,3025   77234 1          RTB     VLOAD
1017  REF   1              14,3026   31270 C                  SET1/PDT
1018  REF   3  LAST 478    14,3027   11453 C                  ZEROVEC
1019  REF  18  LAST 425    14,3030   01472 1          STORE   GCOMP
1020                        14,3031   52014 C          SET     GOTO
1021  REF   1              14,3032   C1060 C                  DRIFTFLG
1022  REF   1              14,3033   31036 C                  FINECNLY
1023                        14,3034   77700 C  CALOOP1 TIX,1
1024  REF   1              14,3035   30775 1                  CALOOP
1025                        14,3036   75160 1  FINEONLY AXC,1  AXC,2
1026  REF  31  LAST 526    14,3037   02671 C                  XSM
1027  REF  24  LAST 710    14,3040   01735 1                  REFSMMAT
1028                        14,3041   77624 1          CALL
1029  REF   1              14,3042   31045 1                  MATMOVE
1030                        14,3043   77650 1          GOTO
1031                        14,3044   00035 1                  29D
1032                        14,3045   77773 1  MATMOVE VLOAD*                TRANSFER MATRIX
1033                        14,3046   00001 C                  0,1
1034                        14,3047   10001 1          STORE   0,2
1035                        14,3050   77773 1          VLOAD*
1036                        14,3051   00007 C                  6D,1
1037                        14,3052   10007 1          STORE   6D,2
1038                        14,3053   77773 1          VLOAD*
1039                        14,3054   00015 C                  12D,1
1040                        14,3055   10015 1          STORE   12D,2
1041                        14,3056   77616 C          RVQ
1042                        14,3057   00056 1  DEGREE1 DEC     46
1043                        14,3060   37722 1  DEG359  DEC     16338
1044  REF   4  LAST 711    15,2000                    SETLOC  P50S
1045                        15,2236                    BANK
1046                        15,2236  0 0004 0  RDCDUS  INHINT                 READ CDUS
1047  REF  16  LAST 658     15,2237  3 0032 C          CA      CDUX
1048  REF  12  LAST 584     15,2240  50 120 1          INDEX   FIXLOC
1049                        15,2241  54 001 1          TS      1
1050  REF   7  LAST 658     15,2242  3 0033 1          CA      CDUY
1051  REF  13  LAST 714     15,2243  50 120 1          INDEX   FIXLOC
1052                        15,2244  54 002 1          TS      2
1053  REF  10  LAST 658     15,2245  3 0034 C          CA      CDUZ
1054  REF  14  LAST 714     15,2246  50 120 1          INDEX   FIXLOC
1055                        15,2247  54 003 C          TS      3
1056                        15,2250  0 0003 1          RELINT
1057  REF   5  LAST 535     15,2251  0 6030 1          TC      DANZIG                                  +
R1058 NAME - GIME
R1059 FUNCTION - DETERMINE AND COMPUTE THE DESIRED GIMBAL ANGLES TO BE USED          FOR COARSE ALIGNMENT.
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R1061   CALLING SEQUENCE - CALL GIMB
R1062   INFLT - DESIRED IMU INERTIAL ORIENTATION VECTORS-XSMD,YSMD,ZSMD
R1063   OUTPUT - GIMBAL ANGLES LEFT IN THETAD,+1,+2                    +
R1064   SUBROUTINES USED - 1.CDUTRIG 2.CALCSMSC 3.CALCGA
 1065   REF  2  LAST  694   16,2000                        SETLOC P50S2
 1066                       16,2567                        BANK
 1067   REF  1                                             COUNT  14/INFLT

 1068                       16,2567   41345 C  CALCSMSC    DLOAD  DMP
 1069   REF  1              16,2570   00737 1              SINCDUY
 1070   REF  2  LAST  533   16,2571   00747 C              COSCDUZ
 1071                       16,2572   77676 C              DCOMP
 1072                       16,2573   70525 1              PDDL   SR1
 1073   REF  2  LAST  533   16,2574   00741 C              SINCDUZ
 1074                       16,2575   41325 C              PDDL   DMP
 1075   REF  1              16,2576   00745 1              COSCDUY
 1076   REF  3  LAST  715   16,2577   00747 C              COSCDUZ
 1077                       16,2600   76466 1              VDEF   VSL1
 1078   REF  5  LAST  705   16,2601   02714 1              STORE  XNB
 1079                       16,2602   41345 C              DLOAD  DMP
 1080   REF  3  LAST  533   16,2603   00743 1              SINCDUX
 1081   REF  3  LAST  715   16,2604   00741 C              SINCDUZ
 1082                       16,2605   77752 1              SL1
 1083                       16,2606   00033 1              STORE  26D
 1084                       16,2607   77605 1              DMP
 1085   REF  2  LAST  715   16,2610   00737 1              SINCDUY
 1086                       16,2611   41325 C              PDDL   DMP
 1087   REF  3  LAST  533   16,2612   00751 1              COSCDUX
 1088   REF  2  LAST  715   16,2613   00745 1              COSCDUY
 1089                       16,2614   77625 C              DSU
 1090                       16,2615   41325 C              PDDL   DMP
 1091   REF  4  LAST  715   16,2616   00743 1              SINCDUX
 1092   REF  4  LAST  715   16,2617   00747 C              COSCDUZ
 1093                       16,2620   77676 C              DCOMP
 1094                       16,2621   41325 C              PDDL   DMP
 1095   REF  4  LAST  715   16,2622   00751 1              COSCDUX
 1096   REF  3  LAST  715   16,2623   00737 1              SINCDUY
 1097                       16,2624   41325 C              PDDL   DMP
 1098   REF  3  LAST  715   16,2625   00745 1              COSCDUY
 1099                       16,2626   00033 1              26D
 1100                       16,2627   55415 1              DAD    VDEF
 1101                       16,2630   77772 C              VSL1
 1102   REF  5  LAST  705   16,2631   02730 1              STORE  ZNB
 1103                       16,2632   76435 1              VXV    VSL1
 1104   REF  6  LAST  715   16,2633   02714 1                     XNB
 1105   REF  4  LAST  415   16,2634   02722 1              STORE  YNB
 1106                       16,2635   77616 C              RVQ
R1107   NAME - P51 - IMU ORIENTATION DETERMINATION
R1108   MCD.NC.2  21 DEC 66                          LOG SECTION - P51-P53
R1110   MCD BY STURLAUGSON                           ASSEMBLY SUNDISK REV15
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R1112 FUNCTIONAL DESCRIPTION

R1113 DETERMINES THE INERTIAL ORIENTATION OF THE IMU. THE PROGRAM IS SELECTED BY DSKY ENTRY. THE SIGHTING
R1115 ROUTINE IS CALLED TO COLLECT THE CDU COUNTERS AND SHAFT AND TRUNNION ANGLES FOR A SIGHTED STAR. THE DATA IS
R1117 THEN PROCESSED AS FOLLOWS.

R1118 1. SEXTANT ANGLES ARE COMPUTED IN TERMS OF NAVIGATIONAL BASE COORDINATES. LET SA AND TA BE THE SHAFT AND
R1120 TRUNNION ANGLES, RESPECTIVELY. THEN,

R1121 -
R1122 V = (SIN(TA)*COS(SA), SIN(TA)*SIN(SA), COS(TA)) (A COLUMN VECTOR)
R1124 NB
R1125 THE OUTPUT IS A HALF-UNIT VECTOR STORED IN STARM.

R1126 2. THIS VECTOR IN NAV.BASE COORDS. IS THEN TRANSFORMED TO ONE IN STABLE MEMBER COORDINATES.

R1128 - T T T -
R1129 V = Q *Q *Q *V , WHERE
R1130 1 2 3 NB

R1131 (COS(IG) 0 -SIN(IG))
R1132 ( )
R1134 Q = (0 1 0), IG=INNER GIMBAL ANGLE
R1136 1 ( )
R1138 (SIN(IG) 0 COS(IG))

R1139
R1140 (COS(MG) SIN(MG) 0)
R1141 ( )
R1142 Q = (-SIN(MG) COS(MG) 0), MG=MIDDLE GIMBAL ANGLE
R1143 2 ( )
R1144 (0 0 1)

R1145
R1146 (1 0 0)
R1147 ( )
R1148 Q = (0 COS(OG) SIN(OG)), OG=OUTER GIMBAL ANGLE
R1149 3 ( )
R1150 (0 -SIN(OG) COS(OG))

R1132 THE GIMBAL ANGLES ARE COMPUTED FROM
R1134 THE CDU COUNTERS AT NBSM (USING AXIS-
R1136 ROT AND COULOGIC)

R1151 3. THE STAR NUMBER IS SAVED AND THE SECOND STAR IS THEN SIMILARLY PROCESSED.

R1153 4. THE ANGLE BETWEEN THE TWO STARS IS THEN CHECKED AT CKSDATA.

R1154 5. REFSMMAT IS THEN COMPUTED AT AXISGEN AS FOLLOWS.
R1155 - -
R1156 LET S AND S BE TWO STAR VECTORS EXPRESSED IN TWO COORDINATE SYSTEMS,A AND B (BASIC AND STABLE MEMBER).
R1158 1 2

R1159 DEFINE, - -

```
R1160                 U  = S
R1161                  A    A1

R1162                 -        -    -
R1163                 V  = UNIT(S  X S  )
R1164                  A          A1   A2

R1165                 -    -   -
R1166                 W = U X V
R1167                  A    A   A
R1168           AND
R1169                 -    -
R1170                 U  = S
R1171                  B    B1

R1172                 -        -    -
R1173                 V  = UNIT(S  X S  )
R1174                  B          B1   B2

R1175                 -    -   -
R1176                 W  = U X V
R1177                  B    B   B

R1178           THEN  -        -        -        -
R1179                 X  = U  *U + V  *V + W  *W
R1180                      B1  A   B1  A   B1  A

R1181                 -        -        -        -          (REFSMMAT)
R1182                 Y  = U  *U + V  *V + W  *W
R1183                      B2  A   B2  A   B2  A

R1184                 -        -        -        -
R1185                 Z  = U  *U + V  *V + W  *W
R1186                      B3  A   B3  A   B3  A

R1187           THE INPUTS CONSIST OF THE FOUR HALF-UNIT VECTORS STORED AS FOLLOWS

R1188                 -
R1189                 S   IN 6-11 OF THE VAC AREA
R1190                  A1

R1191                 -
R1192                 S   IN 12-17 OF THE VAC AREA
R1193                  A2

R1194                 -
R1195                 S   IN STARAD
R1196                  B1

R1197                 -
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R1198                S   IN STARAD +6
R1199                 B2

R1200   CALLING SEQUENCE

R1201     THE PROGRAM IS CALLED BY THE ASTRONAUT BY DSKY ENTRY.

R1202   SUBROUTINES CALLED.

R1203         CDUERR3
R1204         CDUERR1R
R1205         CDUSPR
R1206         IMUCOARS
R1207         IMUFIN20
R1208         P53
R1209         SXTNB
R1210         NBSM
R1211         NKRELEAS
R1212         CHKSDATA
R1213         MATMOVE

R1214   ALARMS

R1215         NONE.

R1216   ERASABLE INITIALIZATION

R1217         IMU ZERO FLAG SHOULD BE SET.

R1218   OUTPUT

R1219         REFSMMAT
R1220         REFSMFLG

R1221   DEBRIS

R1222         WORK AREA
R1223         STARAD
R1224         STARIND
R1225         RESTI
R1226         RESTJ

 1227   REF    5  LAST  712    14,2000                        SETLOC P50S1
 1228                          14,3061                        BANK
 1229   REF    1                                             COUNT  14/P5153

 1230   REF    2  LAST  199    14,3061              P53       EQUALS P51
 1231   REF   42  LAST  379    14,3061  4 1320 C    P51       CS     IMODES30
 1232   REF   26  LAST  686    14,3062  7 4702 1              MASK   BIT9
 1233   REF  173  LAST  698    14,3063  10 000 C              CCS    A
 1234   REF    1               14,3064  0 3070 C              TC     P51A
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1235  REF  29  LAST  697   14,3065  0 5537 C          TC      ALARM
1236                       14,3066   00210 1          OCT     210
1237  REF  54  LAST  713   14,3067  0 4106 1          TC      GOTOPOOH
1238  REF 201  LAST  714   14,3070  0 4555 C  P51A     TC      BANKCALL
1239  REF   1              14,3071   17607 C          CADR    R02ZERO

1240  REF   1              14,3072  3 4720 C  P51AA    CAF     PRFNSTAQ
1241  REF 202  LAST  719   14,3073  0 4555 C          TC      BANKCALL
1242  REF   5  LAST  709   14,3074   20751 C          CADR    GOPERF1
1243  REF  55  LAST  719   14,3075  C 4106 1          TC      GOTOPOOH        TERM.
1244  REF   1              14,3076  0 3141 C          TC      P51B            V 33
1245  REF  69  LAST  711   14,3077  0 5301 C          TC      PHASCHNG
1246                       14,3100   05024 1          OCT     05024
1247                       14,3101   13000 C          OCT     13000
1248  REF   1              14,3102  3 4714 1          CAF     P51ZERO
1249  REF  17  LAST  713   14,3103  55'155 C          TS      THETAD          ZERO THE GIMBALS
1250  REF  18  LAST  719   14,3104  55'156 C          TS      THETAD +1
1251  REF  19  LAST  719   14,3105  55'157 1          TS      THETAD +2
1252  REF   1              14,3106  3 3266 C          CAF     V6N22
1253  REF 203  LAST  719   14,3107  0 4555 C          TC      BANKCALL
1254  REF   2  LAST  440   14,3110   20577 C          CADR    GODSPRET
1255  REF   1              14,3111  3 3267 1          CAF     V41K            NOW DISPLAY COARSE ALIGN VERB 41
1256  REF 204  LAST  719   14,3112  0 4555 0          TC      BANKCALL
1257  REF   3  LAST  719   14,3113   20577 C          CADR    GODSPRET
1258  REF 205  LAST  719   14,3114  0 4555 C          TC      BANKCALL
1259  REF   5  LAST  713   14,3115   16602 1          CADR    IMUCCARS
1260  REF 206  LAST  719   14,3116  0 4555 C          TC      BANKCALL
1261  REF  11  LAST  714   14,3117   17516 C          CADR    IMUSTALL
1262  REF   4  LAST  714   14,3120  0 5646 C          TC      CURTAINS        CAGING OR BAD END
1263  REF 207  LAST  719   14,3121  0 4555 C          TC      BANKCALL        SCHEDULE IFAILOK AND IMUFINED TASKS,IN 5
1264  REF   2  LAST  714   14,3122   17012 1          CADR    IMUFIN20        AND 20 SECS. DIRECT RETURN AND NO STALL,
1265  REF 208  LAST  719   14,3123  0 4555 C          TC      BANKCALL        IF CAGING, BUT T4 WILL ZERO C/A ENABLE.
1266  REF  12  LAST  719   14,3124   17516 C          CADR    IMUSTALL        IF PUT TO SLEEP, IMUFINED WILL WAKE US
1267  REF   5  LAST  719   14,3125  0 5646 C          TC      CURTAINS        UP.
1268  REF 182  LAST  714   14,3126  0 6006 1          TC      INTPRET
1269                       14,3127   77234 1          RTB     VLOAD
1270  REF   2  LAST  714   14,3130   31270 C                  SETI/PDT
1271  REF   4  LAST  714   14,3131   11453 C                  ZEROVEC
1272  REF  19  LAST  714   14,3132   01472 1          STORE   GCOMP
1273                       14,3133   77414 C          SET     EXIT
1274  REF   2  LAST  714   14,3134   01060 C                  DRIFTFLG
1275  REF  70  LAST  719   14,3135  0 5301 C          TC      PHASCHNG
1276                       14,3136   05024 1          OCT     05024
1277                       14,3137   13000 C          OCT     13000
1278  REF   1              14,3140  1 3072 C          TCF     P51AA           COARSE ALIGN DONE - RECYCLE FOR FINE
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P1279 CC STAR SIGHTING AND COMPUTE NEW REFSMMAT

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1280  REF  71  LAST  719   14,3141  0 5301 C  P51B    TC      PHASCHNG
1281                       14,3142   00014 1          OCT     00014
1282  REF 183  LAST  719   14,3143  0 6006 1          TC      INTPRET
1283                       14,3144   40331 1          SSP     SETPD
1284  REF   9  LAST  710   14,3145   00305 1                  STARIND         INDEX-STAR 1 OR 2
1285                       14,3146   00000 1                  0
1286                       14,3147   00001 0                  0
1287                       14,3150   77414 0          CLEAR   EXIT
1288  REF   4  LAST  708   14,3151   00666 1                  TARG2FLG        SHOW STAR MARK-NOT LAND MARK
1289  REF  57  LAST  708   14,3152  3 4712 1          CAF     BIT1
1290  REF   6  LAST  708   14,3153  54 301 1          TS      MARKINDX        INITIALIZE FOR ONE MARK

1291  REF  72  LAST  720   14,3154  0 5301 C  P51C    TC      PHASCHNG
1292                       14,3155   05024 1          OCT     05024
1293                       14,3156   13000 0          OCT     13000
1294  REF  10  LAST  509   14,3157  0 5253 0          TC      CHECKMM
1295                       14,3160   00065 1          MM      53              BACKUP PROGRAM
1296  REF   1              14,3161  1 3167 C          TCF     P51C.1          NOT P53
1297  REF 184  LAST  720   14,3162  0 6006 1          TC      INTPRET
1298                       14,3163   77624 1          CALL
1299  REF   2  LAST  710   14,3164   32252 C                  R56
1300                       14,3165   77650 1          GOTO
1301  REF   1              14,3166   31172 1                  P51C.2
1302  REF 185  LAST  720   14,3167  0 6006 1  P51C.1  TC      INTPRET
1303                       14,3170   77624 1          CALL
1304  REF   3  LAST  698   14,3171   31327 C                  R53             SIGHTING ROUTINE
1305                       14,3172   77624 1  P51C.2  CALL                    COMPUTE LOS IN SM FROM MARK DATA
1306  REF   2  LAST  709   14,3173   31273 C                  SXTSM
1307                       14,3174   77606 1          PUSH
1308                       14,3175   53135 C          SLOAD   BZE
1309  REF  10  LAST  720   14,3176   00305 1                  STARIND
1310  REF   1              14,3177   31204 0                  P51D
1311                       14,3200   45575 1          VLOAD   STADR
1312  REF   7  LAST  710   14,3201   75160 1          STORE   STARSAV2        DOWNLINK
1313                       14,3202   77650 1          GOTO
1314  REF   1              14,3203   31212 1                  P51E
1315                       14,3204   45575 1  P51D    VLOAD   STADR
1316  REF   5  LAST  710   14,3205   61166 1          STODL   STARSAV1
1317  REF  10  LAST  709   14,3206   02607 1                  TSIGHT
1318                       14,3207   77624 1          CALL
1319  REF   3  LAST  709   14,3210   32363 C                  PLANET
1320  REF   4  LAST  710   14,3211   02601 1          STORE   PLANVEC
1321                       14,3212   77776 1  P51E    EXIT
1322  REF  73  LAST  720   14,3213  0 5301 C          TC      PHASCHNG
1323                       14,3214   05024 1          OCT     05024
1324                       14,3215   13000 C          OCT     13000
1325  REF 209  LAST  719   14,3216  0 4555 C          TC      BANKCALL
1326  REF   8  LAST  709   14,3217   16063 C          CADR    MKRELEAS        ZERO MARKSTAT
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1327  REF  11  LAST  720   14,3220  10 304 1          CCS     STARIND
1328  REF   1               14,3221  1 3230 1          TCF     P51F          STAR 2
1329  REF  74  LAST  720   14,3222  0 5301 0          TC      PHASCHNG
1330                        14,3223   05024 1          OCT     05024
1331                        14,3224   13000 0          OCT     13000
1332  REF  58  LAST  720   14,3225  3 4712 1          CAF     BIT1
1333  REF  12  LAST  721   14,3226  54 304 1          TS      STARIND
1334  REF   1               14,3227  1 3154 0          TCF     P51C          GO DO SECOND STAR
1335  REF  75  LAST  721   14,3230  0 5301 0  P51F     TC      PHASCHNG
1336                        14,3231   05024 1          OCT     05024
1337                        14,3232   13000 0          OCT     13000
1338  REF 186  LAST  720   14,3233  0 6006 1          TC      INTPRET
1339                        14,3234   45145 0          DLOAD   CALL
1340  REF  11  LAST  720   14,3235   02607 1                  TSIGHT
1341  REF   4  LAST  720   14,3236   32363 0                  PLANET
1342                        14,3237   24015 0          STOVL   12D
1343  REF   5  LAST  720   14,3240   02601 1                  PLANVEC
1344                        14,3241   24007 0          STOVL   6D
1345  REF   6  LAST  720   14,3242   02611 0                  STARSAV1
1346  REF   8  LAST  712   14,3243   26736 1          STOVL   STARAD
1347  REF   8  LAST  720   14,3244   02617 0                  STARSAV2
1348  REF   9  LAST  721   14,3245   36744 0          STCALL  STARAD +6
1349  REF   2  LAST  711   14,3246   30707 1                  CHKSDATA      CHECK STAR ANGLES IN STARAD AND
1350                        14,3247   77414 0          BON     EXIT
1351  REF   7  LAST  713   14,3250   00314 1                  FREEFLAG
1352  REF   1               14,3251   31253 1                  P51G
1353  REF   2  LAST  719   14,3252  0 3072 1          TC      P51AA
1354                        14,3253   77624 1  P51G    CALL
1355  REF   3  LAST  709   14,3254   47334 0                  AXISGEN       COME BACK WITH REFSMMAT IN XDC
1356                        14,3255   75160 1          AXC,1   AXC,2
1357  REF   4  LAST  532   14,3256   02713 0                  XDC
1358  REF  25  LAST  714   14,3257   01735 1                  REFSMMAT
1359                        14,3260   45014 0          CLEAR   CALL
1360  REF   6  LAST  693   14,3261   01662 1                  REFSMFLG
1361  REF   2  LAST  714   14,3262   31045 1                  MATMOVE
1362                        14,3263   52014 0          SET     GOTO
1363  REF   7  LAST  721   14,3264   01462 0                  REFSMFLG
1364  REF   2  LAST  710   14,3265   32143 0                  ENDP50S
1365  REF   3  LAST  694      4720             PRFMSTAQ =      OCT15
1366  REF 143  LAST  712      4714             P51ZERO  =      ZERO
1367  REF  15  LAST  649      4715             P51FIVE  =      FIVE
1368                        14,3266   01426 0  V6N22    VN     0622
1369                        14,3267   12200 0  V41K     VN     4100
1370  REF  13  LAST  656   14,3270  3 0025 0  SET1/PDT CA     TIME1
1371  REF  10  LAST  527   14,3271  55*074 1          TS      1/PIPADT
1372  REF   6  LAST  714   14,3272  1 6030 0          TCF     DANZIG
```

P1373 SXTSM COMPUTES AN LOS VECTOR IN SM COORD FROM OCDU AND ICDU MARK DATA

```
1374                          14,3273   77620 C  SXTSM     STQ
1375  REF   6  LAST  702     14,3274   00300 1                QMAJ
1376                          14,3275   70740 C            LXC,1  DLOAD*
1377  REF  34  LAST  611     14,3276   01330 C                   MARKSTAT
1378                          14,3277   00001 C                   0D,1
1379  REF  12  LAST  721     14,3300   02607 1            STORE  TSIGHT
1380                          14,3301   66764 1            AXC,2  SLOAD*
1381  REF  13  LAST  721     14,3302   00304 C                   STARIND
1382  REF   1                 14,3303   46451 C                   MKDNCDR,2
1383                          14,3304   76764 C            AXC,2  VLOAD*
1384  REF 274  LAST  706      14,3305   00154 1                   MPAC
1385                          14,3306   00001 C                   0,1
1386                          14,3307   10001 1            STORE  0,2
1387                          14,3310   77743 1            DLOAD*
1388                          14,3311   00006 1                   5,1
1389                          14,3312   10006 C            STORE  5,2
1390                          14,3313   77624 1            CALL
1391  REF   4  LAST  566      14,3314   46000 C                   SXTNB          COMPUTE LOS VECTOR FROM OCDU IN MKVAC
1392                          14,3315   62150 1            LXA,1  INCR,1
1393  REF  35  LAST  722      14,3316   01330 C                   MARKSTAT
1394                          14,3317   00002 C                   2              INCREMENT TO BASE ADR OF ICDU
1395                          14,3320   45130 1            SXA,1  CALL
1396  REF  28  LAST  713      14,3321   00050 1                   S1
1397  REF   2  LAST  566      14,3322   47541 1                   NBSM           TRANSFORM LOS TO SM
1398                          14,3323   77650 1                GOTO
1399  REF   7  LAST  722      14,3324   00300 1                   QMAJ
1400  REF   9  LAST  566      14,3325   03674 1  MKDNCDR  ECADR  MARKDOWN
1401  REF   2  LAST  168      14,3326   03502 C           ECADR  MARK2DWN
```

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R1402   PROGRAM DESCRIPTION - R53 - SIGHTING MARK ROUTINE
R1403   MCD.NO.2  21 DEC 66
R1404   MOD BY STOFLAUGSON

R1405   FUNCTIONAL DESCRIPTION
R1406           TO PERFORM A SATISFACTORY NUMBER OF SIGHTING MARKS FOR THE REQUESTING PROGRAM (OR ROUTINE). SIGHTINGS
R1408   CAN BE MADE ON A STAR OR LANDMARK. WHEN THE CMC ACCEPTS A MARK IT RECORDS AND STORES 5 ANGLES (3 ICDUS AND 2
R1410   OCDUS) AND THE TIME OF THE MARK.

R1411   CALLING SEQUENCE
R1412     R53 IS CALLED AND RETURNS IN INTERPRETIVE CODE. RETURN IS VIA QPRET.
R1413     THERE IS NO ERROR EXIT IN THIS ROUTINE ITSELF.

R1414   SUBROUTINES CALLED
R1415     SXTMARK
R1416     OPTSTALL
R1417     GOFLASH

R1418   ERASABLE INITIALIZATION
R1419     TARGET FLAG - STAR OR LANDMARK
R1420     MARKINDX - NUMBER OF MARKS WANTED
R1421     STARIND - INDEX TO BESTI OR BESTJ (STAR NUMBER)
R1422   OUTPUT
R1423     MARKSTAT CONTAINS INDEX TO VACANT AREA WHERE MARK DATA IS STORED
R1424     BESTI (INDEXED BY STARIND) CONTAINS STAR NUMBER SIGHTED
R1425   DEBRIS
R1426     MARKINDX CONTAINS NUMBER OF MARKS DESIRED
 1427   REF   2  LAST  62C    14,2000                  SETLOC RT53
 1428                         14,3327                  BANK

 1429   REF   1                                        COUNT  14/R53

 1430                         14,3327   43020 1  R53   STQ    SET          SET SIGHTING MARK FLAG
 1431   REF   2  LAST  114    14,3330   03501 0        R53EXIT
 1432   REF   2  LAST  696    14,3331   00071 1        R53FLAG
 1433                         14,3332   77776 1        EXIT
 1434   REF   7  LAST  72C    14,3333   3 0301 0 R53A  CA     MARKINDX     NUMBER OF MARKS
 1435   REF   2  LAST  197    14,3334   7 4716 1        MASK   LOW3
 1436   REF 21C  LAST  72C    14,3335   0 4555 0        TC     BANKCALL
 1437   REF   2  LAST  444    14,3336    16002 1        CADR   SXTMARK
 1438   REF 211  LAST  723    14,3337   0 4555 0        TC     BANKCALL
 1439   REF   2  LAST  444    14,3340    17512 1        CADR   OPTSTALL
 1440   REF   6  LAST  719    14,3341   0 5646 0        TC     CURTAINS
 1441   REF  3E  LAST  722    14,3342   51'330 0        INDEX  MARKSTAT
 1442   REF  15  LAST  707    14,3343   10 052 1        CCS    QPRET        NUMBER OF MARKS ACTUALLY DONE
 1443   REF   1               14,3344   1 3355 0        TCF    R53B
 1444                         14,3345   1 3347 0        TCF    +2           ZERO
 1445                         14,3346   1 3347 0        TCF    +1           CCS HOLE
 1446   REF 144  LAST  721    14,3347   3 4714 1        CAF    ZERO         HOUSEKEEP VAC AREA SAVE
 1447   REF  37  LAST  723    14,3350   57'330 0        XCH    MARKSTAT      AND MARKSTAT
```

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1448   REF 174  LAST  718   14,3351  1C 000 C          CCS     A
1449   REF 175  LAST  724   14,3352  5C 000 1          INDEX   A
1450                        14,3353  54 000 C          TS      0
1451   REF   1              14,3354  1 3333 C          TCF     R53A
1452   REF  11  LAST  720   14,3355  0 5253 C  R53B    TC      CHECKMM
1453                        14,3356   00026 C          MM      22
1454                        14,3357  1 3361 1          TCF     +2
1455   REF   1              14,3360  1 3405 1          TCF     R53D
14551  REF  12  LAST  724   14,3361  0 5253 C          TC      CHECKMM
14552                       14,3362   00027 1          MM      23
14553  REF   1              14,3363  1 3365 C          TCF     R53C
14554  REF   2  LAST  724   14,3364  1 3405 1          TCF     R53D
1456   REF   1              14,3365  3 3411 C  R53C    CAF     V01N71
1457   REF 212  LAST  723   14,3366  0 4555 C          TC      BANKCALL
1458   REF  16  LAST  708   14,3367   20763 1          CADR    GOFLASHR
1459   REF  56  LAST  719   14,3370  0 4106 1          TC      GOTOPOOH        TERM.
1460   REF   1              14,3371  1 3376 1          TCF     R53Z
1461   REF   2  LAST  724   14,3372  0 3365 1          TC      R53C            RECYCLE
1462   REF  25  LAST  708   14,3373  3 6211 C          CAF     SIX
1463   REF  14  LAST  708   14,3374  0 5415 1          TC      BLANKET
1464   REF  94  LAST  708   14,3375  0 5112 C          TC      ENDOFJOB
1465   REF   2  LAST  474   14,3376  4 7713 1  R53Z    CS      HIGH9
1466   REF   7  LAST  708   14,3377  7 0735 1          MASK    STARCODE
1467                        14,3400  0 0006 1          EXTEND
1468   REF   1              14,3401  7 6211 1          MP      SIGHTSIX
1469   REF  68  LAST  680   14,3402  56 001 C          XCH     L
1470   REF  14  LAST  722   14,3403  50 304 C          INDEX   STARIND
1471   REF  12  LAST  708   14,3404  54 302 1          TS      BESTI
1472   REF 187  LAST  721   14,3405  0 6006 1  R53D    TC      INTPRET
1473                        14,3406   77614 1  R53OUT  SETGO
1474   REF   2  LAST  696   14,3407  03420 1          TERMIFLG        SET TERMINATE FOR R52
1475   REF   3  LAST  723   14,3410  03501 C          R53EXIT
1476   REF  26  LAST  724      6211          SIGHTSIX =      SIX
1477                        14,3411  00307 C  V01N71  VN      0171
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P1478   NAME-S52.2
R1479   FUNCTION-COMPUTE GIMBAL ANGLES FOR DESIRED SM AND PRESENT VEHICLE
R1480   CALL-  CALL  S52.2
R1481   INPUT- X,Y,ZSMD
R1482   OUTPUT- OGC,IGC,MGC,THETAD,+1,+2
R1483   SUBROUTINES-CDUTRIG,CALCSMSC,MATMOVE,CALCGA
 1484   REF   1                 11,2000                     SETLOC  S52/2
 1485                           11,2256                     BANK

 1486   REF   1                                             COUNT   13/S52.2
 1487                           11,2256   77620 0  S52.2    STQ
 1488   REF   8  LAST  722      11,2257   00300 1           QMAJ
 1489                           11,2260   77624 1           CALL
 1490   REF   7  LAST  704      11,2261   47432 1           CDUTRIG
 1491                           11,2262   77624 1           CALL
 1492   REF   2  LAST  704      11,2263   34567 1           CALCSMSC
 1493                           11,2264   66370 0           AXT,1   SSP
 1494                           11,2265   00022 1                   18D
 1495   REF  29  LAST  722      11,2266   00051 0                   S1
 1496                           11,2267   00006 1                   6D
 1497                           11,2270   61373 1  S52.2A   VLOAD*  VXM
 1498   REF   7  LAST  715      11,2271   02736 1                   XNB +18D,1
 1499   REF  26  LAST  721      11,2272   01736 1                   REFSMMAT
 1500                           11,2273   77656 1           UNIT
 1501   REF   8  LAST  725      11,2274   06736 0           STORE   XNB +18D,1
 1502                           11,2275   77700 0           TIX,1
 1503   REF   1                 11,2276   22270 1                   S52.2A
 1504                           11,2277   75160 1  S52.2.1  AXC,1   AXC,2
 1505   REF   6  LAST  695      11,2300   00306 1                   XSMD
 1506   REF  32  LAST  714      11,2301   02671 0                   XSM
 1507                           11,2302   77624 1           CALL
 1508   REF   3  LAST  721      11,2303   31045 1                   MATMOVE
 1509                           11,2304   77624 1           CALL
 1510   REF   2  LAST  415      11,2305   47244 0                   CALCGA
 1511                           11,2306   77650 1           GOTO
 1512   REF   9  LAST  725      11,2307   00300 1                   QMAJ
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R1513   PROGRAM NAME - SR52.1              DATE DEC 20  66
R1514   MOD 1                             LOG SEC  P51-P53
R1515   BY  KEN VINCENT                   ASSEMBLY  SUNDISK  REV 40
R1516
R1517   FUNCTION
R1518    TARG1 AND TARG2 FLAGS ARE LOOKED AT TO DETERMINE IF THE TARGET IS THE
R1519    LEM, STAR OR LANDMARK. IN CASE OF LEM OR LMK,THE PRESENT TIME PLUS
R1520    2 SECONDS IS SAVED IN ADPTIME (ALIAS STARAD ,+1 ). IF THE LEM  IS
R1521    THE TARGET  THEN CONIC UPDATES     OF THE CSM AND LEM ARE MADE TO
R1522    THE TIME IN ADPTIME. THE UNIT OF THE DIFFERENCE OF LEM AND CSM
R1523    POSITION VECTORS BECOMES THE REFERENCE SIGHTING VECTOR  USED IN THE
R1524    COMMON PART OF THIS PROGRAM.
R1525    IN THE CASE OF LANDMARK, THE CSM IS UPDATED CONICALLY. THE RADIUS
R1526    VECTOR FOR THE LANDMARK IS OBTAINED FROM LALOTORV. BOTH OF THESE ARE
R1527    FOUND FOR THE TIME IN ADPTIME. THE UNIT OF THE DIFFERENCE BETWEEN
R1528    THE LANDMARK AND CSM RADIUS VECTORS BECOMES THE REFERENCE SIGHTING
R1529    VECTOR FOR THE COMMON PART OF THIS ROUTINE.
R1530    IF A STAR IS THE TARGET, THE PROPER STAR IS OBTAINED FROM THE CATALOG
R1531    AND THIS VECTOR BECOMES THE REFERENCE SIGHTING VECTOR.
R1532    THE COMMON PART OF THIS PROGRAM  TRANSFORMS THE REFERENCE SIGHTING
R1533    VECTOR INTO STABLE MEMBER COORDINATES. IT READS THE IMU-CDUS AND USES
R1534    THIS DATA IN A CALL TO CALCSXA. ON RETURN FROM CALCSXA A TEST IS
R1535    MADE TO SEE IF THE TRUNNION ANGLE IS GREATER THAN  90DEG OR 38DEG.
R1536    MADE TO SEE IF THE TRUNNION ANGLE IS GREATER THAN 90DEG. OR 50DEG.

R1537   CALLING SEQUENCE
R1538   L+4       RETURN WHEN SHAFT OR TRUNION NOT WITHIN 5DEG OF DESIRED
R1539   L         TC     BANKCALL
R1540   L+1       CADR   SR52.1
R1541   L+2       ERROR RETURN   TRUNNION GREATER THAN 90DEG
R1542   L+3       ERROR RETURN   TRUNNION GREATER THAN 50DEG
R1543   L+4       NORMAL RETURN
R1544
R1545   OUTPUT
R1546   SAC -SINGLE PREC,2S COMP,SCALED AT HALF REVS- SHAFT ANGLE DESIRED
R1547   PAC -SINGLE PREC,2S COMP SCALED AT EIGTH REVS - TRUNNION ANGLE DESIRED
R1548
R1549   INITIALIZATION
R1550   IF TARG1FLG =1 THEN TARGET IS LEM -NO OTHER INPUT REQUIRED
R1551   IF TARG1FLG =0 AND TARG2FLG =0 THE TARGET IS STAR, STARIND SHOULD
R1552   0 OR 1 DENOTING BESTI OR BESTJ RESPECTIVELY AS STAR CODE. STAR CODES
R1553   ARE 6 TIMES STAR NUMBER.
R1554   IF TARG1FLG=0 AND TARG2FLG=1 THEN TARGET IS LANDMARK. SEE ROUTINE
R1555   LALOTORV FOR INPUT REQUIREMENTS. HERE FIXERAD=1 FOR CONSTANT EARTH
R1556   RADIUS
R1557
R1558   DEBRIS
R1559    WORK AREA
R1560    STARAD - STAR+5 (STAR IS DESIRED LOS IN STABLE MEMBER COORDINATES)
 1561   REF   1                                          COUNT* $$/SR521
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1562  REF   1                 13,2000                        SETLOC SR52/1
1563                          13,2176                        BANK

1564  REF   4  LAST  704      13,2176  C 4604 1  SR52.1      TC     MAKECADR
1565  REF  11  LAST  713      13,2177  55'777 C               TS     QMIN
1566  REF 188  LAST  724      13,2200  0 6006 1               TC     INTPRET
1567                          13,2201   43234 C               RTB    DAD
1568  REF  21  LAST  708      13,2202   45505 C                      LOADTIME
1569  REF   1                 13,2203   26317 C                      1.3SECDP
1570  REF   3  LAST   88      13,2204   02356 C               STORE  AOPTIME
1571                          13,2205   43014 C               BON    BON
1572  REF   7  LAST  708      13,2206   00705 C                      TARG1FLG
1573  REF   1                 13,2207   26214 1                      LEM52
1574  REF   5  LAST  720      13,2210   00706 C                      TARG2FLG
1575  REF   1                 13,2211   26224 1                      LMK52
1576                          13,2212   77650 1               GOTO
1577  REF   1                 13,2213   26245 C                      STAR52
1578                          13,2214   77745 1  LEM52       DLOAD
1579  REF   4  LAST  727      13,2215   02356 C                      AOPTIME
1580  REF  40  LAST  701      13,2216   34041 C               STCALL TDEC1
1581  REF   4  LAST  584      13,2217   27057 C                      LEMCONIC
1582                          13,2220   77775 1               VLOAD
1583  REF  27  LAST  702      13,2221   00001 C                      RATT
1584                          13,2222   77650 1               GOTO
1585  REF   1                 13,2223   26234 C                      LMKLMCOM
1586                          13,2224   71214 C  LMK52       BON    DLOAD
1587  REF   3  LAST  699      13,2225   04305 C                      ADVTRK
1588  REF   1                 13,2226   54000 C                      ADVTRACK
1589  REF   5  LAST  727      13,2227   02356 C                      AOPTIME
1590                          13,2230   77624 1               CALL
1591  REF   6  LAST  695      13,2231   26373 1                      LALOTORV
1592                          13,2232   77775 1               VLOAD
1593  REF  10  LAST  695      13,2233   02152 C                      ALPHAV
1594  REF  11  LAST  443      13,2234   16766 1  LMKLMCOM    STODL  STAR
1595  REF   6  LAST  727      13,2235   02356 C                      AOPTIME
1596  REF  41  LAST  727      13,2236   34041 C               STCALL TDEC1
1597  REF   6  LAST  701      13,2237   27045 C                      CSMCONIC
1598                          13,2240   52375 1               VLOAD  VSU
1599  REF  12  LAST  727      13,2241   02766 1                      STAR
1600  REF  28  LAST  727      13,2242   00001 C                      RATT
1601                          13,2243   52056 C               UNIT   GOTO
1602  REF   1                 13,2244   26260 1                      COM52
1603                          13,2245   72131 1  STAR52      SSP    LXA,1
1604  REF  30  LAST  725      13,2246   00051 C                      S1
1605                          13,2247   00000 1                      0
1606  REF  15  LAST  724      13,2250   00304 C                      STARIND
1607                          13,2251   77700 C               TIX,1
1608  REF   1                 13,2252   26256 1                      ST52ST
1609                          13,2253   52175 0               VLOAD  GOTO
1610  REF   9  LAST  721      13,2254   02617 C                      STARSAV2
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1611  REF  2  LAST  727   13,2255   26260 1                    COM52
1612                      13,2256   77775 1  ST52ST   VLOAD
1613  REF  7  LAST  721   13,2257   02611 0                    STARSAVI
1614                      13,2260   53521 1  COM52    MXV      UNIT
1615  REF 27  LAST  725   13,2261   01736 1                    REFSMMAT
1616  REF 13  LAST  727   13,2262   02766 1           STORE    STAR
1617                      13,2263   45001 1           SETPD    CALL
1618                      13,2264   00001 0                    0
1619  REF  8  LAST  725   13,2265   47432 1                    CDUTRIG      COMPUTES SINES AND COSINES FOR CALCSXA
1620                      13,2266   77624 1           CALL                    NOW EXPECT TO SEE THE CDU ANGLES.
1621  REF  1              13,2267   46034 1                    CALCSXA
1622                      13,2270   77414 0           BOFF     EXIT
1623  REF  8  LAST  707   13,2271   01750 1                    CULTFLAG
1624  REF  1              13,2272   26274 1                    TRUN38
1625  REF  1              13,2273  0 2312 0           TC       SR52E1
1626                      13,2274   45345 1  TRUN38   DLOAD    DSU
1627  REF  8  LAST  697   13,2275   02776 0                    PAC
1628  REF  1              13,2276   26315 1                    38TRDEG
1629                      13,2277   71244 0           BPL      DLOAD
1630  REF  1              13,2300   26305 0                    SR52E22
1631  REF  9  LAST  728   13,2301   02776 0                    PAC
1632                      13,2302   51025 1           DSU      BPL
1633  REF  1              13,2303   26321 0                    20DEGSMN
1634  REF  1              13,2304   26307 1                    SR52E3
1635                      13,2305   77776 1  SR52E22  EXIT
1636  REF  1              13,2306  0 2311 0           TC       SR52E2
1637                      13,2307   77776 1  SR52E3   EXIT
1638  REF 12  LAST  727   13,2310  25'777 1           INCR     QMIN
1639  REF 13  LAST  728   13,2311  25'777 1  SR52E2   INCR     QMIN
1640  REF 14  LAST  728   13,2312  3 1777 1  SR52E1   CA       QMIN
1641  REF  4  LAST  707   13,2313  0 4561 1           TC       SWCALL
1642                      13,2314   25252 0  38TRDEG  2DEC     .66666667    CORESPONDS TO 50 DEGS IN TRUNION
1642                      13,2315   25254 0
1643                      13,2316   00000 1  1.3SECDP 2DEC     130
1643                      13,2317   00202 1
1644                      13,2320   61740 0  20DEGSMN DEC      -07199
1645                      13,2321   77777 0           DEC      -0
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P1646      THE ADVTRACK ROUTINE IS USED TO COMPUTE AN OPTICS LOS VECTOR TO
R1647   A POINT ON THE GROUND TRACK 60 DEGREES FORWARD OF THE LOCAL VERTICAL
R1648   OF AN ADVANCED ORBIT A SPECIFIED NUMBER OF REVOLUTIONS FROM NOW

 1649   REF    1                26,2000                    SETLOC 26P5OS
 1650                           26,2000                    BANK
 1651                           26,2000   77601 0  ADVTRACK SETPD
 1652                           26,2001   00001 0           0
 1653                           26,2002   41575 0  VLOAD    PUSH          INITIALIZE FOR RP-TO-R
 1654   REF    2  LAST   31     26,2003   15324 0           UNITZ         UZ VEC IN PD 0-5
 1655                           26,2004   41434 1  RTB      PUSH          TIME IN PD 6-7
 1656   REF   22  LAST  727     26,2005   45505 0           LOADTIME
 1657   REF    7  LAST  727     26,2006   36356 1  STCALL   AOPTIME       TIME ALSO IN AOPTIME FOR CSMCONIC
 1658   REF    4  LAST  694     26,2007   55341 1           RP-TC-R       GET MOON ROTATION VEC IN REF
 1659   REF   14  LAST  728     26,2010   16766 1  STODL    STAR
 1660   REF    8  LAST  729     26,2011   02356 0           AOPTIME       PICK UP TIME
 1661   REF   42  LAST  727     26,2012   34041 0  STCALL   TDEC1         UPDATE STATE TO TIME
 1662   REF    7  LAST  727     26,2013   27045 0           CSMCONIC
 1663                           26,2014   47375 0  VLOAD    VXV
 1664   REF   20  LAST  702     26,2015   00007 0           VATT
 1665   REF   29  LAST  727     26,2016   00001 0           RATT
 1666                           26,2017   77656 1  UNIT
 1667                           26,2020   24031 0  STOVL    24D           SAVE -UNIT(V X R) FOR 2ND ROTATION
 1668   REF   30  LAST  729     26,2021   00001 0           RATT
 1669                           26,2022   57456 1  UNIT     VCOMP
 1670                           26,2023   41401 1  SETPD    PUSH          PUSH LOS=-UNIT(RVEC)  PD 0-5
 1671                           26,2024   00001 0           0
 1672                           26,2025   77776 1  EXIT
 1673   REF   23  LAST  612     26,2026   3 1751 0 CA       LANDMARK
 1674   REF   12  LAST  593     26,2027   7 4716 1 MASK     SEVEN         GET NUMBER OF ADVANCE PERIODS
 1675                           26,2030   0 0006 1 EXTEND
 1676   REF   22  LAST  684     26,2031   7 4700 0 MP       BIT11         GET N/16
 1677   REF   69  LAST  724     26,2032   56 001 0 XCH      L
 1678   REF   15  LAST  714     26,2033   50 120 1 INDEX    FIXLOC
 1679                           26,2034   54 036 0 TS       30D           TEMP STORE N/16
 1680   REF 189  LAST  727     26,2035   0 6006 1 TC       INTPRET
 1681                           26,2036   41335 1  SLOAD    DMP
 1682                           26,2037   00037 0           30D
 1683   REF    1                26,2040   14107 1           MPERIOD
 1684   REF    9  LAST  729     26,2041   36356 1  STCALL   AOPTIME       ROTATE ANG ABOUT UR
 1685   REF    1                26,2042   54057 1           ROTA
 1686                           26,2043   77775 1  VLOAD
 1687                           26,2044   00031 0           24D           PICK UP 2ND ROTATION AXIS
 1688   REF   15  LAST  729     26,2045   16766 1  STODL    STAR
 1689   REF    1                26,2046   14105 0           DP1/6
 1690                           26,2047   77625 0  DSU
 1691   REF   10  LAST  729     26,2050   02356 0           AOPTIME       2ND RAT ANGLE = 60 - A
 1692   REF   11  LAST  729     26,2051   36356 1  STCALL   AOPTIME
 1693   REF    2  LAST  729     26,2052   54057 1           ROTA          GO ROTATE 2ND TIME
 1694                           26,2053   77775 1  VLOAD
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1695                        26,2054  00001 C                  0
1696  REF  16  LAST  729    26,2055  36766 C          STCALL  STAR     STORE FINAL LOS IN STAR
1697  REF   3  LAST  728    26,2056  26260 1                  COM52    RETURN TO SR52.1

1698                        26,2057  73545 1  ROTA    DLOAD   SIN
1699  REF  12  LAST  729    26,2060  02356 C                  AOPTIME
1700                        26,2061  47315 C          PDVL    VXV      PUSH 1/2SIN(A)  PD  6-7
1701  REF  17  LAST  730    26,2062  02766 1                  STAR       UR VEC
1702                        26,2063  00001 C                  0          LOS
1703                        26,2064  72561 C          VXSC    VSL2     1/2SIN(A)(URXLOS)  PD 6-11
1704                        26,2065  50315 C          PDVL    DOT
1705  REF  18  LAST  730    26,2066  02766 1                  STAR
1706                        26,2067  00001 C                  0
1707                        26,2070  72561 C          VXSC    VSL2
1708  REF  19  LAST  730    26,2071  02766 1                  STAR
1709                        26,2072  71525 C          PDDL    COS      1/2(UR . LOS)UR  12-17
1710  REF  13  LAST  730    26,2073  02356 C                  AOPTIME
1711                        26,2074  51315 1          PDVL    BVSU     PUSH 1/2COS(A)  18-19
1712                        26,2075  00015 C                  12D
1713                        26,2076  00001 C                  0
1714                        26,2077  76561 1          VXSC    VSL1     UP 18-19
1715                        26,2100  53255 C          VAD     VAD      UP 12-17  UP 6-11
1716                        26,2101  40256 1          UNIT    SETPD
1717                        26,2102  00001 C                  0
1718                        26,2103  43406 1                  PUSH    RVQ

1719                        26,2104  05252 1  DP1/6   2DEC    .16666666
1719                        26,2105  25251 C
1720                        26,2106  11446 1  MPERIOD 2DEC    .2992          APPROX LUNAR ROT ANG IN 2 HRS X 16
1720                        26,2107  02760 1
```

```
P1721   NAME-S52.3
R1722   FUNCTION- XSMD= UNIT(YSMD X ZSMD)
R1723             YSMD= UNIT(V X R)
R1724             ZSMD= UNIT(-R)
R1725   CALL      CLOAD  CALL
R1726                    TALIGN
R1727                    S52.3
R1728   INPUT-    TIME OF ALIGNMENT IN MPAC
R1729   OUTPUT-   X,Y,ZSMD
R1730   SUBROUTINES- CSMCONIC
 1731   REF   3 LAST 715   16,2000                        SETLOC P50S2
 1732                      16,2636                        BANK

 1733   REF   1                                          COUNT  15/S52.3
 1734                      16,2636   77620 0   S52.3     STQ
 1735   REF  10 LAST 729   16,2637   00300 1             QMAJ
 1736   REF  43 LAST 729   16,2640   34041 0   STCALL    TDEC1
 1737   REF   8 LAST 729   16,2641   27045 0             CSMCONIC
 1738                      16,2642   77601 0   SETPD
 1739                      16,2643   00001 0             0
 1740                      16,2644   57575 1   VLOAD     VCOMP
 1741   REF  31 LAST 729   16,2645   00001 0             RATT
 1742                      16,2646   77656 1   UNIT
 1743   REF   3 LAST 695   16,2647   24323 0   STOVL     ZSMD
 1744   REF  21 LAST 729   16,2650   00007 0             VATT
 1745                      16,2651   53435 0   VXV       UNIT
 1746   REF  32 LAST 731   16,2652   00001 0             RATT
 1747   REF   4 LAST 695   16,2653   00315 0   STORE     YSMD
 1748                      16,2654   53435 0   VXV       UNIT
 1749   REF   4 LAST 731   16,2655   00323 0             ZSMD
 1750   REF   7 LAST 725   16,2656   34307 1   STCALL    XSMD
 1751   REF  11 LAST 731   16,2657   00300 1             QMAJ
```

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P1752   PROGRAM DESCRIPTION - R56 - ALTERNATE LOS SIGHTING MARK ROUTINE

R1753   FUNCTIONAL DESCRIPTION
R1754           TO PERFORM SIGHTING MARKS FOR THE BACK-UP ALIGNMENT PROGRAMS (P53,P54).  THE ASTRONAUT KNOWS THE
R1756   COORDINATES (OPTICS) OF THE ALTERNATE LINE OF SIGHT HE MUST USE FOR THIS ROUTINE.  WHEN THE ASTRONAUT KEYS IN
R1758   ENTER IN RESPONSE TO THE FLASHING V50 N25 R1-XXXXX THE CMC STORES THE THREE ICDU ANGLES AND TWO ANGLES DISPLAYED
R1760   IN N92.

R1761   CALLING SEQUENCE
R1762           CALL
R1763                   R56

R1764   SUBROUTINES CALLED
R1765           A PORTION OF SXTMARK (VAC.AREA SEARCH)
R1766           GOFLASH
R1767           GOPERF1

R1768   ERASABLE INITIALIZATION
R1769           STARIND-INDEX TO STAR NUMBER

R1770   OUTPUT
R1771           MARKSTAT-INDEX TO VAC.AREA WHERE OUTPUT IS STORED.
R1772           BESTI (INDEXED BY STARIND) CONTAINS STAR NUMBER.
R1773           ICDU AND OCDU ANGLES IN VAC. AREA AS FOLLOWS-
R1774                   VAC +2  CDUY
R1775                   VAC +3  CDUS
R1776                   VAC +4  CDUZ
R1777                   VAC +5  CDUT
R1778                   VAC +6  CDUX

 1779   REF   1                                                 COUNT* $$/R56
 1780   REF   5  LAST  714    15,2000                          SETLOC P50S
 1781                         15,2252                          BANK
 1782                         15,2252   77776 1   R56          EXIT
 1783   REF   1               15,2253   3 2362 1               CAF     V06N94B
 1784   REF 213  LAST  724    15,2254   0 4555 C               TC      BANKCALL
 1785   REF  34  LAST  713    15,2255    20624 0               CADR    GOFLASH
 1786   REF  57  LAST  724    15,2256   0 4106 1               TC      GOTOPOOH        TERM.
 1787   REF   1               15,2257   0 2261 C               TC      R56A            PROCEED - ANGLES OK
 1788                         15,2260   0 2253 1               TC      -5              ENTER - NEW ANGLES
 1789   REF 214  LAST  732    15,2261   0 4555 C   R56A        TC      BANKCALL
 1790   REF   3  LAST  723    15,2262    16004 1               CADR    SXTMARK +2      INHIBIR EXT VB ACT AND FIND VAC AREA

17904   REF 145  LAST  723    15,2263   3 4714 1               CAF     ZERO
17905   REF 215  LAST  732    15,2264   0 4555 C               TC      BANKCALL
17906   REF   6  LAST  712    15,2265    20607 1               CADR    CLEANDSP

 1791   REF   1               15,2266   3 2360 C               CAF     V853            DISPLAY V53 REQUESTING ALTERNATE MARK
 1792   REF 216  LAST  732    15,2267   0 4555 C               TC      BANKCALL
 1793   REF   3  LAST  561    15,2270    20470 0               CADR    GOMARK2
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1794   REF  58  LAST  732   15,2271  1 4106 C          TCF     GOTOPOOH        V34-TERMINATE
1795   REF   2  LAST  732   15,2272  1 2263 C          TCF     R56A +2         V33-DONT PROCEED-JUST ENTER TO MARK
17951  REF 150  LAST  729   15,2273  0 6006 1          TC      INTPRET
17952                        15,2274   77745 1          DLOAD
17953  REF  36  LAST  573   15,2275   03731 1                   MRKBUF1 +3
17954  REF  10  LAST  698   15,2276   16774 1          STODL   SAC
17956  REF  37  LAST  733   15,2277   03733 C                   MRKBUF1 +5
17957  REF  10  LAST  728   15,2300   02776 C          STORE   PAC
17958                        15,2301   77776 1          EXIT
1796                         15,2302  0 0004 C          INHINT
1797                         15,2303  0 0006 1          EXTEND
1798   REF  25  LAST  692   15,2304  3 0025 C          DCA     TIME2
1799   REF  38  LAST  723   15,2305  51'330 C          INDEX   MARKSTAT
1800                         15,2306  52 001 1          DXCH    0
1801   REF   8  LAST  714   15,2307  3 0033 1          CA      CDUY            ENTER-THIS IS A BACKUP SYSTEM MARK
1802   REF  39  LAST  733   15,2310  51'330 C          INDEX   MARKSTAT
1803                         15,2311  54 002 1          TS      2
1804   REF  11  LAST  733   15,2312  3 1773 C          CA      SAC
1805   REF  40  LAST  733   15,2313  51'330 C          INDEX   MARKSTAT
1806                         15,2314  54 003 C          TS      3
1807   REF  11  LAST  714   15,2315  3 0034 C          CA      CDUZ
1808   REF  41  LAST  733   15,2316  51'330 C          INDEX   MARKSTAT
1809                         15,2317  54 004 1          TS      4
1810   REF  11  LAST  733   15,2320  3 1775 C          CA      PAC
1811   REF  42  LAST  733   15,2321  51'330 C          INDEX   MARKSTAT
1812                         15,2322  54 005 C          TS      5
1813   REF  17  LAST  714   15,2323  3 0032 C          CA      CDUX
1814   REF  43  LAST  733   15,2324  51'330 C          INDEX   MARKSTAT
1815                         15,2325  54 006 C          TS      6
1816                         15,2326  0 0003 1          RELINT
18161  REF   4  LAST  698   15,2327  0 5425 1          TC      CLEARMRK        ENABLE EXTENDED VERBS
1817   REF   1              15,2330  3 4333 C          CAF     OCT16
1818   REF 217  LAST  732   15,2331  0 4555 C          TC      BANKCALL
1819   REF   6  LAST  719   15,2332   20751 C          CADR    GOPERF1
1820   REF  59  LAST  733   15,2333  0 4106 1          TC      GOTOPOOH        TERM.
1821   REF   1              15,2334  1 2336 1          TCF     R56B            PROCEED-MARK COMPLETED
1822   REF   3  LAST  733   15,2335  1 2263 C          TCF     R56A +2          RECYCLE - DO ANOTHER MARK - LIKE REJECT
18225  REF 146  LAST  732   15,2336  3 4714 1  R56B    CAF     ZERO
1823   REF 218  LAST  733   15,2337  0 4555 C          TC      BANKCALL
1824   REF   7  LAST  732   15,2340   20607 1          CADR    CLEANDSP

1825   REF   1              15,2341  3 2361 1          CAF     V01N71B
1826   REF 219  LAST  733   15,2342  0 4555 C          TC      BANKCALL
1827   REF  35  LAST  732   15,2343   20624 C          CADR    GOFLASH
1828   REF  60  LAST  733   15,2344  0 4106 1          TC      GOTOPOOH
1829                         15,2345  0 2347 C          TC      +2
1830   REF   2  LAST  733   15,2346  1 2336 1          TCF     R56B            RECYCLE
1831   REF   3  LAST  724   15,2347  4 7713 1          CS      HIGH9
1832   REF   8  LAST  724   15,2350  7 0735 1          MASK    STARCODE
1833                         15,2351  0 0006 1          EXTEND
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1834  REF  27  LAST  724   15,2352  7 6211 1          MP      SIX
1835  REF  70  LAST  729   15,2353  56 001 C          XCH     L
1836  REF  16  LAST  727   15,2354  50 304 C          INDEX   STARIND
1837  REF  13  LAST  724   15,2355  54 302 1          TS      BESTI
1838  REF 191  LAST  733   15,2356  0 6006 1          TC      INTPRET
1839                       15,2357   77616 C          RVQ
1840                       15,2360   15200 1  VB53    VN      05300       ALTERNATE MARK VERB
1841                       15,2361   00307 C  V01N718 VN      00171
1842                       15,2362   01536 C  V06N94B VN      00694
1843  REF  13  LAST  722   15,2363   02607 1  PLANET  STORE   TSIGHT
1844                       15,2364   45020 1          STQ     CALL
1845  REF  15  LAST  728   15,2365   02777 1                  QMIN
1846  REF   2  LAST  693   15,2366   30216 1                  LOCSAM
1847                       15,2367   77775 1          VLOAD
1848  REF   5  LAST  701   15,2370   02736 1                  VEARTH
1849                       15,2371   24001 C          STOVL   OD
1850  REF   8  LAST  702   15,2372   02744 1                  VSUN
1851  REF   6  LAST  734   15,2373   26736 1          STOVL   VEARTH
1852                       15,2374   00001 C                  OD
1853  REF   9  LAST  734   15,2375   02744 1          STORE   VSUN
1854                       15,2376   77776 1  NOSAM   EXIT
1855  REF   4  LAST  733   15,2377  4 7713 1          CS      HIGH9
1856  REF   9  LAST  733   15,2400  7 0735 1          MASK    STARCODE
1857                       15,2401  0 0006 1          EXTEND
1858  REF   2  LAST  724   15,2402  7 6211 1          MP      SIGHTSIX
1859  REF  71  LAST  734   15,2403  56 001 C          XCH     L
1860  REF  17  LAST  734   15,2404  50 304 C          INDEX   STARIND
1861  REF  14  LAST  734   15,2405  54 302 1          TS      BESTI
1862  REF 176  LAST  724   15,2406  10 000 C          CCS     A
1863  REF   1              15,2407  1 2423 1          TCF     NOTPLAN
1864  REF   1              15,2410  3 2453 1          CAF     VNPLANV
1865  REF 220  LAST  733   15,2411  0 4555 C          TC      BANKCALL
1866  REF  36  LAST  733   15,2412   20624 C          CADR    GOFLASH
1867  REF  61  LAST  733   15,2413  0 4106 1          TC      GOTOPOOH
1868                       15,2414  0 2416 C          TC      +2
1869                       15,2415  0 2410 C          TC      -5
1870  REF 192  LAST  734   15,2416  0 6006 1          TC      INTPRET
1871                       15,2417   53575 C          VLOAD   UNIT
1872  REF  20  LAST  730   15,2420   02766 1                  STAR
1873                       15,2421   77650 1          GOTO
1874  REF   1              15,2422   32446 C                  CORPLAN
1875  REF 177  LAST  734   15,2423  4 0000 C  NOTPLAN CS      A
1876  REF   1              15,2424  6 2452 C          AD      DEC227
1877                       15,2425  0 0006 1          EXTEND
1878  REF   1              15,2426  6 2437 C          BZMF    CALSAM1
1879  REF  18  LAST  734   15,2427  50 304 C          INDEX   STARIND
1880  REF  15  LAST  734   15,2430  3 0302 C          CA      BESTI
1881  REF  16  LAST  729   15,2431  50 120 1          INDEX   FIXLOC
1882  REF  32  LAST  705   15,2432  54 046 1          TS      X1
1883  REF 193  LAST  734   15,2433  0 6006 1          TC      INTPRET
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1884                                15,2434   52173 C             VLOAD*  GOTO
1885  REF  10  LAST  706           15,2435   31751 C                     CATLOG,1
1886  REF   2  LAST  734           15,2436   32446 C                     CORPLAN
1887  REF 194  LAST  734           15,2437  0 6006 1  CALSAM1     TC      INTPRET
1888                                15,2440   70740 C             LXC,1   DLOAD*
1889  REF  19  LAST  734           15,2441   00304 C                     STARIND
1890  REF  16  LAST  734           15,2442   00303 1                     BESTI,1
1891                                15,2443   76740 C             LXC,1   VLOAD*
1892  REF 275  LAST  722           15,2444   00154 1                     MPAC
1893  REF  10  LAST  721           15,2445   02372 C                     STARAD -2280,1
1894                                15,2446   53455 C  CORPLAN    VAD     UNIT
1895  REF   5  LAST  702           15,2447   03474 C                     VEL/C
1896                                15,2450   77650 1             GOTO
1897  REF  16  LAST  734           15,2451   02777 1                     QMIN
1898                                15,2452   00343 C  DEC227     DEC     227
1899                                15,2453   01530 C  VNPLANV    VN      0688
```

P0001 LUNAR AND SOLAR EPHEMERIDES SUBROUTINES

R0002 FUNCTIONAL DESCRIPTION

R0003 THESE SUBROUTINES ARE USED TO DETERMINE THE POSITION AND VELOCITY
R0004 VECTORS OF THE SUN AND THE MOON RELATIVE TO THE EARTH AT THE
R0005 SPECIFIED GROUND ELAPSED TIME INPUT BY THE USER.

R0006 THE POSITION OF THE MOON IS STORED IN THE COMPUTER IN THE FORM OF
R0007 A NINTH DEGREE POLYNOMIAL APPROXIMATION WHICH IS VALID OVER A 15
R0008 DAY INTERVAL BEGINNING SHORTLY BEFORE LAUNCH. THEREFORE THE TIME
R0009 INPUT BY THE USER SHOULD FALL WITHIN THIS 15 DAY INTERVAL.

R0010 LSPOS COMPUTES THE POSITION VECTORS OF THE SUN AND THE MOON.

R0011 LUNPOS COMPUTES THE POSITION VECTOR OF THE MOON.

R0012 LUNVEL COMPUTES THE VELOCITY VECTOR OF THE MOON.

R0013 SOLPOS COMPUTES THE POSITION VECTOR OF THE SUN.

R0014 CALLING SEQUENCE

R0015 CLOAD CALL
R0016 TIME GROUND ELAPSED TIME
R0017 SUBROUTINE LSPOS OR LUNPOS OR LUNVEL OR SOLPOS

R0018 INPUT

R0019 1) SPECIFIED GROUND ELAPSED TIME IN CS X B-28 LOADED IN MPAC.

R0020 2) TIMEMC - TIME AT THE CENTER OF THE RANGE OVER WHICH THE LUNAR
R0021 POSITION POLYNOMIAL IS VALID IN CS X B-42.

R0022 3) VECOEM - VECTOR COEFFICIENTS OF THE LUNAR POSITION POLYNOMIAL
R0023 LOADED IN DESCENDING SEQUENCE IN METERS/CS**N X B-2

R0024 4) RESO - POSITION VECTOR OF THE SUN RELATIVE TO THE EARTH AT
R0025 TIMEMC IN METERS X B-38.

R0026 5) VESO - VELOCITY VECTOR OF THE SUN RELATIVE TO THE EARTH AT
R0027 TIMEMC IN METERS/CS X B-9.

R0028 6) OMEGAES - ANGULAR VELOCITY OF THE VECTOR RESO AT TIMEMC IN
R0029 REV/CS X B+26.

R0030 ALL EXCEPT THE FIRST INPUT ARE INCLUDED IN THE PRE-LAUNCH
R0031 ERASABLE DATA LOAD.

R0032 OUTPUT - LSPOS

R0033 1) 2D OF VAC AREA CONTAINS THE POSITION VECTOR OF THE SUN RELATIVE
R0034 TO THE EARTH AT TIME INPUT BY THE USER IN METERS X B-38.

R0035 2) MPAC CONTAINS THE POSITION VECTOR OF THE MOON RELATIVE TO THE
R0036 EARTH AT TIME INPUT BY THE USER IN METERS X B-29.

R0037 OUTPUT - LUNPOS

R0038 MPAC CONTAINS THE POSITION VECTOR OF THE MOON RELATIVE TO THE
R0039 EARTH AT THE TIME INPUT BY USER IN METERS X B-29.

R0040 OUTPUT - LUNVEL

R0041 MPAC CONTAINS THE VELOCITY VECTOR OF THE MOON RELATIVE TO THE
R0042 EARTH AT TIME INPUT BY THE USER IN METERS/CS X B-7.

R0043 OUTPUT - SOLPOS

R0044 MPAC CONTAINS THE POSITION VECTOR OF THE SUN RELATIVE TO THE EARTH
R0045 AT TIME INPUT BY THE USER IN METERS X B-38.

R0046 SUBROUTINES USED

R0047 NONE

R0048 REMARKS

R0049 THE VAC AREA IS USED FOR STORAGE OF INTERMEDIATE AND FINAL RESULTS
R0050 OF COMPUTATIONS.

R0051 S1, X1 AND X2 ARE USED BY THESE SUBROUTINES.
R0052 PRELAUNCH ERASABLE DATA LOAD ARE ONLY ERASABLE STORAGE USED BY
R0053 THESE SUBROUTINES.
R0054 RESTARTS DURING OPERATION OF THESE SUBROUTINES MUST BE HANDLED BY
R0055 THE USER.

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0056                        36,2502                 BANK    36
0057  REF   1               26,2000                 SETLOC  EPHEM
0058                        26,2110                 BANK

0059  REF   1                                       COUNT*  $$/EPHEM
0060  REF   2  LAST  209    E7,1777                 EBANK=  END-E7
0061                        26,2110   77774 C  LSPOS  AXT,2
0062  REF   1               26,2111   54161 C         RESA    COMPUTES POSITION VECTORS OF BOTH THE
0063                        26,2112   52170 C  AXT,1  GOTO    SUN AND THE MOON.  THE POSITION VECTOR
0064  REF   1               26,2113   54143 C         RES     OF THE SUN IS STORED IN 2D OF THE VAC
0065  REF   1               26,2114   54126 C         LSTIME  AREA.  THE POSITION VECTOR OF THE MOON
0066                        26,2115   52170 C  LUNPOS AXT,1  GOTO    IS STORED IN MPAC.
0067  REF   1               26,2116   54162 C         REM     COMPUTES THE POSITION VECTOR OF THE MOON
0068  REF   2  LAST  737    26,2117   54126 C         LSTIME  AND STORES IT IN MPAC.
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0069                          26,2120  52170 0  LUNVEL   AXT,1   GOTO      COMPUTES THE VELOCITY VECTOR OF THE MOON
0070  REF   1                 26,2121  54173 C           VEM     VEM       AND STORES IT IN MPAC.
0071  REF   3  LAST  737      26,2122  54126 C           LSTIME  LSTIME
0072                          26,2123  76020 1  SOLPOS   STQ     AXT,1     COMPUTES THE POSITION VECTOR OF THE SUN
0073  REF  12  LAST  673      26,2124  00047 1                   X2        AND STORES IT IN MPAC.
0074  REF   2  LAST  737      26,2125  54143 C                   RES
0075                          26,2126  54201 C  LSTIME   SETPD   SR
0076                          26,2127  00001 C                   0D
0077                          26,2130  20617 0                   14D
0078                          26,2131  57571 C           TAD     DCOMP
0079  REF  12  LAST  528      26,2132  01707 C                   TEPHEM
0080                          26,2133  57571 C           TAD     DCOMP
0081  REF   2  LAST   85      26,2134  02034 1                   TIMEMO
0082                          26,2135  66261 1           SL      SSP
0083                          26,2136  20221 1                   16D
0084  REF  31  LAST  727      26,2137  00051 0                   S1
0085                          26,2140  00006 1                   6D
0086                          26,2141  77650 1           GOTO
0087  REF  33  LAST  734      26,2142  00046 C                   X1
0088                          26,2143  41206 C  RES      PUSH    DMP                                        PD- 2
0089  REF   1                 26,2144  02147 1                   OMEGAES
0090                          26,2145  71406 C           PUSH    COS                                        PD- 4
0091                          26,2146  65361 C           VXSC    PDDL                                       PD- 8
0092  REF   2  LAST   86      26,2147  02133 1                   RESO
0093                          26,2150  63356 1           SIN     PDVL                                       PD-10
0094  REF   3  LAST  738      26,2151  02133 1                   RESO
0095                          26,2152  53406 C           PUSH    UNIT                                       PD-16
0096                          26,2153  53435 C           VXV     UNIT
0097  REF   3  LAST  614      26,2154  02141 1                   VESO
0098                          26,2155  76435 1           VXV     VSL1                                       PD-10
0099                          26,2156  53361 C           VXSC    VAD                                        PD-02
0100                          26,2157  52172 1           VSL1    GOTO      RES IN METERS X 8-38 IN MPAC.
0101  REF  13  LAST  738      26,2160  00047 1                   X2
0102                          26,2161  14003 1  RESA     STODL   2D        RES IN METERS X 8-38 IN 2D OF VAC. PD- 0
0103                          26,2162  63370 C  REM      AXT,1   PDVL                                       PD- 2
0104                          26,2163  00066 1                   54D
0105  REF   2  LAST   85      26,2164  02037 1                   VECOEM
0106                          26,2165  52761 C  REMA     VXSC    VAD*
0107                          26,2166  00001 C                   0D
0108  REF   3  LAST  738      26,2167  02133 1                   VECOEM +60D,1
0109                          26,2170  72500 1           TIX,1   VSL2      REM IN METERS X 8-29 IN MPAC.
0110  REF   1                 26,2171  54165 1                   REMA
0111                          26,2172  77616 C           RVQ
0112                          26,2173  65370 C  VEM      AXT,1   PDDL                                       PD- 2
0113                          26,2174  00060 1                   48D
0114  REF   1                 26,2175  14214 C                   NINE84
0115                          26,2176  74206 C           PUSH    VXSC                                       PD- 4
0116  REF   4  LAST  738      26,2177  02037 1                   VECOEM
0117                          26,2200  77761 1  VEMA     VXSC
0118                          26,2201  00001 C                   0D
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0119                          26,2202   14005 1            STODL   4D                                          PD- 2
0120                          26,2203   41425 1            DSU     PUSH                                        PD- 4
0121  REF   1                 26,2204   14216 1                    ONEB4
0122                          26,2205   53357 0            VXSC*   VAD
0123  REF   5  LAST  738      26,2206   02125 0                    VECQEM +54D,1
0124                          26,2207   00005 1                    4D
0125                          26,2210   72500 1            TIX,1   VSL2              VEM IN METERS/CS X B-7 IN MPAC.
0126  REF   1                 26,2211   54200 1                    VEMA
0127                          26,2212   77616 0            RVQ
0128                          26,2213   22000 1  NINEB4    2DEC    9.0 B-4
0128                          26,2214   00000 1
0129                          26,2215   02000 0  ONEB4     2DEC    1.0 B-4
0129                          26,2216   00000 1
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R0001   PROGRAM:              P61
R0002   MOD NO.:              0    MAR. 13, 1967
R0003   MOD BY:               R. HIRSCHKOP
R0004   MOD NO:  1            MOD BY:  RR BAIRNSFATHER     DATE:  22 JUN 67    RESTARTS.
R0006   MOD NO:  2            MOD BY:  RR BAIRNSFATHER     DATE:  17 JAN 68    COLOSSUS GSOP CHANGES.
R0008   MOD NO:  3            MOD BY:  RR BAIRNSFATHER     DATE:   8 MAY 68    DELETE CMSM MANEUVER (PCR 50)
R0010   FUNCTION:             TO CALCULATE AND DISPLAY EMS INITIALIZATION DATA
R0011   CALLING SEQUENCE-     BY V37
R0012   EXIT-                 TO P62
R0013   SUBROUTINE CALLS-     S61.1 , S61.3 , GOFLASH , FLAGUP , R02BOTH

R0014   ERASABLE INITIALIZATION:
R0015           EMSALT  (-29) M          .05G ALTITUDE ABOVE FISCHER ELLIPSOID   PAD LOADED.
R0017           ALFAPAD  /180            HYPERSONIC CM TRIM ANGLE OF ATTACK      PAD LOADED
R0019   OUTPUT: THE FOLLOWING REGISTERS ARE WRITTEN IN FOR USE BY DISPLAYS
R0020           GMAX   100 GMAX  (-14)  G,S      MAXIMUM ACCELERATION
R0021           VPRED  (-7)  M/CS        PREDICTED VELOCITY AT 400K FT
R0022           GAMMAEI  GAMMA/360       PREDICTED GAMMA    AT 400K FT
R0023           RTGO   THETAH/360        RANGE ANGLE TO SPLASH FROM EMSALT       EMSALT IS PAD LOADED
R0025           VIO    (-7) M/CS         INERTIAL VELOCITY  AT      EMSALT       EMSALT IS PAD LOADED
R0027           TTE    (-28) CS          TIME       TO              EMSALT       EMSALT IS PAD LOADED
R0029           LAT(SPL)  /360           TARGET LOCATION                         LEFT BY DSKY
R0031           LNG(SPL)  /360           TARGET LOCATION                         LEFT BY DSKY
R0033           HEADSUP   (0)            +1 = LIFT DOWN,  -1 = LIFT UP           LEFT BY DSKY
R0035   DEBRIS: SEE SUBROUTINES.

 0036                          26,2217                 BANK    26
 0037   REF   1                26,2000                 SETLOC  P60S
 0038                          26,2217                 BANK

 0039   REF  15  LAST  528     E6,1661                 EBANK=  AOG

 0040   REF   1                                        COUNT*  $$/P61

 0041   REF  41  LAST  689     26,2217  3 4675 1  P61  CA      BIT14          EXTENDED VERB SHOULD BE FREE THIS CLOSE
 0042   REF  18  LAST  558     26,2220  55'044 1      TS      EXTVBACT       TO V37
A0043                                                                       LOCK OUT EXTENDED VERBS SO CAN USE TFF
A0044                                                                       ROUTINES.EXT VERB ERASE IS USED

 0045   REF  89  LAST  686     26,2221  4 4712 0      CS      ONE            REMOVE IF HEADSUP EVER ON UPLINK DATA
 0046   REF   3  LAST  273     26,2222  55'726 1      TS      HEADSUP        PRELOAD

 0047   REF   1                26,2223  0 2543 1      TC      S61.1          CHECK STATE VECTOR AND IMU ORIENTATION
A0048                                                                  RV GOGENRET. DOES PHASCHNG, GROUP 4.

 0049   REF   1                26,2224  3 2424 1      CA      V06N61         LAT(SPL)     LNG(SPL)     HEADSUP
A0050                                                                       XXX.XX DEG   XXX.XX DEG   XXXXX.
 0051   REF 221  LAST  734     26,2225  0 4555 0      TC      BANKCALL
 0052   REF  17  LAST  724     26,2226    20763 1     CADR    GOFLASHR
 0053   REF  62  LAST  734     26,2227  0 4106 1      TC      GOTOPOOH
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0054   REF   1                 26,2230  0 2235 1            TC      P61.4
0055                           26,2231  0 2224 1            TC      -5

0056   REF  76  LAST  721      26,2232  0 5301 0  P61.3     TC      PHASCHNG
0057                           26,2233   00014 1            OCT     00014

0058   REF  95  LAST  724      26,2234  0 5112 0            TC      ENDOFJOB

0061                           26,2235  22 007 0  P61.4     ZL
0062   REF   4  LAST  74C      26,2236  11'726 1            CCS     HEADSUP       C(HEADSUP)=  +1/-1
0063   REF  42  LAST  74C      26,2237  3 4675 1            CA      BIT14         IF HEADSUP POS,ROLLC =180 DEG.(LIFT DWN)
0064                           26,2240  12 241 0            NOOP                  IF HEADSUP NEG,ROLLC=0 (LIFT UP)
0065   REF   5  LAST  274      26,2241  53'716 1            DXCH    ROLLC         ROLLC IS USED BY S62.3: GIM ANG AT .05G

0066   REF 195  LAST  735      26,2242  0 6006 1            TC      INTPRET
0067                           26,2243   77745 1  NEWRNVN   DLOAD
0068   REF   9  LAST  677      26,2244   01205 1            PIPTIME       SAVE TIME OF RN,VN TO DETERMINE IF AN
0069   REF   2  LAST  115      26,2245   37651 1            STCALL  MM    UPDATE HAS OCCURRED
0070   REF   1                 26,2246   52063 0            STARTEN1      INITIALIZE
0071                           26,2247   77775 1            VLOAD
0072   REF  11  LAST  677      26,2250   01171 1            RN
0073   REF  15  LAST  633      26,2251   02327 0            STORE   RONE
0074                           26,2252   77656 1            UNIT
0075   REF   1                 26,2253   26343 1            STOVL   URONE
0076   REF  10  LAST  653      26,2254   01177 1            VN
0077   REF  10  LAST  511      26,2255   02335 0            STORE   VONE
0078                           26,2256   53435 0            VXV     UNIT
0079   REF   2  LAST  741      26,2257   02343 1            URONE
0080   REF   2  LAST  115      26,2260   03502 0            STORE   UNI
0081                           26,2261   45345 1  DUMPP61   DLOAD   DSU
0082   REF   3  LAST  741      26,2262   03651 0            MM            INITIAL VALUE OF PIPTIME
0083   REF  10  LAST  741      26,2263   01205 1            PIPTIME
0084                           26,2264   45040 1            BMN     CALRB
0085   REF   1                 26,2265   54243 0            NEWRNVN       UPDATED... GO TRY AGAIN
0086   REF   1                 26,2266   5465C 0            S61.2         GET DISPLAY DATA FOR N60 AND N63
A0087                                                                     AND RETURN IN BASIC, BELOW.
0089   REF   5  LAST  733      26,2267  0 5425 1  P61.1     TC      CLEARMRK
0090   REF   1                 26,2270  3 2423 0            CA      V06N60        GMAX          VPRED          GAMMAEI
A0091                                                                     XXX.XX G      XXXXX. FPS     XXX.XX DEG
0092   REF 222  LAST  74C      26,2271  0 4555 0            TC      BANKCALL
0093   REF  37  LAST  734      26,2272    20624 0           CADR    GOFLASH

0094   REF  63  LAST  74C      26,2273  0 4106 1            TC      GOTOPOOH
0095   REF   1                 26,2274  0 2276 0            TC      P61.2         PROCEED
0096                           26,2275  0 2270 0            TC      -5

0097   REF 196  LAST  741      26,2276  0 6006 1  P61.2     TC      INTPRET       CORRECT  TTE  FOR TIME LAPSE DURING
A0098                                                                     ABOVE DISPLAY.
0099                           26,2277   45234 0            RTB     DSU
0100   REF  23  LAST  729      26,2300   45505 0            LOADTIME      CURRENT TIME.
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 0101   REF   4  LAST  741    26,2301   03651 C                MM              PIPTIME FOR RONE & VONE.
 0102                         26,2302   77615 C          DAD
 0103   REF   2  LAST  117    26,2303   03733 C                TTE1            NEGATIVE OF FREE FALL TIME.
 0104   REF   5  LAST  273    26,2304   03727 C          STORE TTE             DECREMENTED

 0105                         26,2305   77776 1          EXIT

 0106   REF   1               26,2306   3 2425 C         CA    V06N63          RTGO          VIC           TTE
A0107                                                                          XXXX.X NM     XXXXX. FPS    XXBXX M,S
 0108   REF 223  LAST  741    26,2307   0 4555 C         TC    BANKCALL
 0109   REF  38  LAST  741    26,2310    20624 0         CADR  GOFLASH
 0110   REF  64  LAST  741    26,2311   0 4106 1         TC    GOTOPOOH
 0111                         26,2312   0 2314 C         TC    +2
 0112   REF   2  LAST  741    26,2313   0 2276 C         TC    P61.2           REDO

R0113                                  .... THEN FALL INTO P62
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R0114   PROGRAM-              P62
R0115   MOD NO.-              0    MAR. 13, 1967
R0116   MOD BY-               R. HIRSCHKOP
R0117   MOD NO:  1           MOD BY:  RR BAIRNSFATHER      DATE: 21 MAR 67
R0118   MOD NO:  2           MOD BY:  RR BAIRNSFATHER      DATE:  22 JUN 67     RESTARTS.
R0120   MOD NO:  3           MOD BY:  RR BAIRNSFATHER      DATE:  17 JAN 68     COLOSSUS GSOP CHANGES.
R0122   MOD NO:  4           MOD BY:  RR BAIRNSFATHER      DATE:   8 MAY 68     MOVE START OF DESIRED GIMBAL CALC.
R0124   FUNCTION-            1) TO NOTIFY CREW WHEN GNC SYSTEM IS PREPARED FOR CM/SM SEPARATION
R0126                        2) TO ORIENT THE CM TO THE CORRECT ATTITUDE FOR ATMOSPHERIC ENTRY
R0128   CALLING SEQUENCE-    BY V37 OR DIRECTLY FROM P61
R0129   EXIT-                TO P63
R0130   ERASABLE INITIALIZATION:
R0131           ALFAPAD                                    LEFT BY PAD LOAD
R0132           LADPAD                                     LEFT BY PAD LOAD
R0133           LODPAD                                     LEFT BY PAD LOAD
R0134           LAT(SPL)     (MAY BE CHANGED BELOW)        LEFT BY DSKY, VIA P61
R0136           LNG(SPL)     (MAY BE CHANGED BELOW)        LEFT BY DSKY, VIA P61
R0138           HEADSUP      (MAY BE CHANGED BELOW)        LEFT BY DSKY, VIA P61
R0140   SUBROUTINE CALLS:   NEWMODEX , S61.1 , CM/DAPIC , CM/DAPON , R02BOTH , GOPERF1 , GOFLASH , GODSPR

 0142   REF   1                                        COUNT* $$/P62

 0143   REF   7 LAST  529   26,2314  0 5243 1          TC     NEWMODEX        MODE CHANGE IF CAME FROM P61.
 0144                       26,2315   00076 0          MM     62              MODE CHANGE AUTOMATIC VIA V 37.
 0145   REF  90 LAST  74C   26,2316  3 4712 1          CA     ONE
 0146   REF   4 LAST  195   26,2317  54 332 1          TS     DNLSTCOD

 0147   REF   2 LAST  74C   26,2320  0 2543 1  P62     TC     S61.1           CHECK STATE VECTOR AND IMU ORIENTATION.

 0148   REF 157 LAST  741   26,2321  0 6006 1          TC     INTPRET
 0149                       26,2322   47131 1          SSP    RTB
 0150   REF   2 LAST  109   26,2323   03325 0          POSEXIT
 0151   REF   1             26,2324   54402 0          P62.3           CALCULATE DESIRED .05G GIMBAL ANGLES,
A0152                                                                   WITHOUT DISPLAY.
 0153   REF   1             26,2325   41630 1          CM/DAPIC        START CM/POSE AND BODY RATE CALC

A0154                                                      DOES 2PHSCHNG, OCT 40116, OCT 05024, OCT 13000.
A0155                                                                  CM/DAPIC SETS EBANK = EBANK

A0156                                                                  AND RETURNS IN BASIC TO P62.2.
 0157                       26,2326  0 0006 1  P62.2     EXTEND
 0158   REF   1             26,2327  3 2431 0          DCA    POSECADR        CONTINUE WITH CM/POSE AFTER AV G.
 0159   REF   8 LAST  644   26,2330  53'223 1          DXCH   AVEGEXIT

 0160   REF   1             26,2331  3 4270 0          CAF    OCT41           REQUEST SEPARATION
 0161   REF 224 LAST  742   26,2332  0 4555 0          TC     BANKCALL
 0162   REF   1             26,2333   21031 0          CADR   GOPERF1R
 0163   REF  65 LAST  742   26,2334  0 4106 1          TC     GOTOPOOH
 0164                       26,2335  0 2340 1          TC   .  +3              PROCEED
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A0165                                                          NOTE:  NODOFLAG WILL BE SET IN CM/DAPON. <<<
 0166                          26,2336  0 2331 1        TC     -5             ENTER
 0167  REF   1                 26,2337  0 2232 C        TC     P61.3          FOR PHASCHNG AND ENDOFJOB.

 0168  REF  44 LAST  687       26,2340  0 4574 C  +3    TC     POSTJUMP
 0169  REF   1                 26,2341   41550 1        CADR   CM/DAPON       DISABLE RCS DAP, ENABLE ENTRY DAP AND
A0170                                                          DC ATTITUDE HOLD.

A0171                                                          WILL IDLE UNTIL CM/POSE DOES ONE UPDATE.
A0172                                                          CM/DAPON DOES NO PHASCHNG.


 0173  REF   2 LAST  740       26,2342  3 2424 1  P62.1  CA     V06N61         LAT(SPL)     LNG(SPL)     HEADSUP
A0174                                                          XXX.XX DEG   XXX.XX DEG   0000X.

A0175                                                              TERMINATE  ATTITUDE HOLD. SET UP COMMANDS:
A0176                                                              ROLLC,  ALFACOM,  BETACOM.   BEGIN MANUVER TO
A0177                                                              ENTRY ATTITUDE.

 0178  REF 225 LAST  743       26,2343  0 4555 C        TC     BANKCALL
 0179  REF  39 LAST  742       26,2344    20624 C       CADR   GOFLASH
 0180                          26,2345  0 2342 C        TC     -3
 0181                          26,2346  0 2350 C        TC     +2
 0182                          26,2347  0 2342 C        TC     -5

 0183  REF  77 LAST  741       26,2350  0 5301 C        TC     PHASCHNG
 0184                          26,2351    04024 C       OCT    04024          USE ENTRYVN FOR DISPLAY BELOW.

A0185                                                          EBANK WAS SET IN CM/DAPON TO EBA0G

 0186  REF   5 LAST  741       26,2352  11'726 1        CCS    HEADSUP        C(HEADSUP) = +/- 1
 0187  REF  43 LAST  741       26,2353  3 4675 1        CA     BIT14          IF HEADSUP POS,ROLLC=180 DEG (LIFT DWN)
 0188                          26,2354  12 355 1        NOOP                  IF HEADSUP NEG,ROLLC=0 DEG  (LIFT UP)
 0189  REF   6 LAST  741       26,2355  55'715 1        TS     ROLLC
 0190  REF   1                 26,2356  3 1411 1        CA     ALFAPAD        NOMINAL ALFATRIM PAD LOADED, NEG. NO.
 0191                          26,2357  22 007 C        ZL
 0192  REF   2 LAST  109       26,2360  53'604 C        DXCH   ALFACOM        SET ALFACOM = ALFA TRIM, BETACOM=0

 0193  REF  91 LAST  743       26,2361  3 4712 1        CA     ONE            PERMITS EXDAP2 TO CHANGE FLAG TO +0
 0194  REF   1                 26,2362  55'727 C        TS     P63FLAG        AS INDICATOR. STARTS UP P63.

 0195  REF   2 LAST  389       26,2363  3 4745 C        CA     V06N22         SET UP DISPLAY FOR CDU DESIRED VALUES
 0196  REF   2 LAST   77       26,2364  55'263 C        TS     ENTRYVN        FROM ENTRY ATTITUDE CALC, THAT IS
A0197                                                          ALREADY GOING.
 0198  REF  44 LAST  696       26,2365  0 5435 C        TC     UPFLAG         TURN ON ENTRY DISPLAY
 0199  REF   1                 26,2366    00134 1       ADRES  ENTRYDSP       ENTRYDSP = 920  BIT 13  FLAG 6
A01991                                          SKIP
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0200  REF   4  LAST  172   26,2367  4 1700 C          CS      CMDAPMOD      GO DIRECTLY TO P63 IF BODY ATTITUDE
0201  REF  52  LAST  744   26,2370  7 4712 C          MASK    ONE           IS SUCH THAT THE DELAY TASK: WAKEP62
0202                       26,2371  0 0006 1          EXTEND                WILL BE OMITTED.
0203  REF   1               26,2372  1 2420 1          BZF     P63.1         DISABLE GRP 4, GO TO ENDOFJOB.

A0204                                                                      (IE, CONTINUE IF CMDAPMOD = -1, OR +0)
0205  REF   1               26,2373  0 2406 1          TC      P63

A0206                                                                      PUT JOB TO SLEEP UNTIL VEHICLE MANUVER HAS
A0207                                                                      REDUCED ALFA TO +/-45 DEG. CONSIDER REMAINING
A0208                                                                      65 DEG (25 DEG IF ALFA NEG) TO ALFA TRIM TO
A0209                                                                      OCCUR AT 3 DEG/SEC, AND TERMINATE P62 AT THAT
A0210                                                                      TIME.
A0211                                                                      TASK WAKEP62 IS CALLED FROM ENTRY DAP.

0212  REF   2  LAST  608   26,2374  3 4760 1  WAKEP62  CA      PRIO13
0213  REF  24  LAST  66C   26,2375  0 5027 1            TC      NOVAC
0214  REF  16  LAST  74C   E6,1661                     EBANK=  AOG
0215  REF   2  LAST  745   26,2376   02406 1          2CADR   P63
0215                       26,2377   54066 C
0216  REF  40  LAST  684   26,2400  0 5213 1          TC      TASKOVER

0217  REF   2  LAST  743   26,2401   54402 C  P62.3CAD CADR    P62.3

A0218                                                                      EACH 2 SEC, CALCULATE GIMBAL ANGLES FOR ENTRY CON-
A0219                                                                      DITIONS THAT WILL HOLD IF REORIENTATION WERE MADE
A0220                                                                      AT PRESENT RN, VN. COME HERE FROM CM/POSE AND ALSO
A0221                                                                      IN KEPLER PHASE OF ENTRY.
0222                       26,2402   52131 0  P62.3    SSP     GOTO          SET RETURN ADDRESS SO THAT   ROUTINE
0223  REF  16  LAST  723   26,2403   00053 1                    QPRET         GOES DIRECTLY TO ENTRY GUIDANCE EXIT
0224  REF   1               26,2404   53570 C                    ENDEXIT       THAT DOES ENTRY DISPLAY ,GRP 5.
0225  REF   1               26,2405   20302 1                    S62.3          PUT DESIRED COU VALUES IN CPHI'S FOR
A0226                                                                      N22 DISPLAY.
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P0227                P63
R0228   PROGRAM-                P63
R0229   MOD NO.-                0    MAR. 13, 1967
R0230   MOD BY-                 R. HIRSCHKOP
R0231   MOD NO: 1               MOD BY: RR BAIRNSFATHER      DATE: 22 JUN 67     RESTARTS.
R0233   MOD NO: 2               MOD BY: RR BAIRNSFATHER      DATE: 14 JUL 67     REVISED RESTARTS
R0235   FUNCTION-               1) TO INITIALIZE THE ENTRY EQUATIONS
R0236                           2) TO CONTINUE TO HOLD THE CM TO THE CORRECT ATTITUDE WITH RESPECT TO THE ATMOSPHERE FOR
R0238                              THE ONSET OF ENTRY DECELERATION. ROLL ANGLE IS LIFT UP/DOWN AS SPECIFIED BY HEADSUP.
R0240                           3) TO SENSE .05 G
R0241   CALLING SEQUENCE-       DIRECTLY FROM P62
R0242   EXIT-                   TO ENDOFJOB
R0243   SUBROUTINE CALLS-       NEWMODEX , GOODSPR

 0244   REF   1                                              COUNT* $$/P63

 0245   REF   8  LAST  743     26,2406  0 5243 1  P63       TC      NEWMODEX
 0246                           26,2407   00077 1            MM      63

 02461  REF 226  LAST  744     26,2410  0 4555 0           TC      BANKCALL        FLUSH N22 DISPLAY, IF ON. (ONIT DISP
 02462  REF   8  LAST  733     26,2411   20607 1           CADR    CLEANDSP        DURING STARTENT PASS.)

A0247                                                                            ARRIVE WITH EBANK = AOG.

 0248   REF   1                26,2412  3 2427 1           CA      ENTCADR         CONTINUE AT STARTENT AFTER CM/POSE .

A0249                                                                            AT END OF STARTENT, CHANGE ADDRESS IN GOTOADDR
A0250                                                                            TO CONTINUE AT  SCALEPOP  THEREAFTER.

 0251   REF   3  LAST  743     26,2413  55'724 0           TS      POSEXIT

 0252   REF   1                26,2414  3 2426 0           CA      V06N64          G           VI          R TO SPLSH
A0253                                                                            XXX.XX G    XXXXX. FPS  XXXX.X NM
 0254   REF   3  LAST  744     26,2415  55'263 0           TS      ENTRYVN         FOR DISPLAY CALL IN OVERNOUT.

 02541  REF  53  LAST  745     26,2416  4 4712 0           CS      ONE             IN CASE FLAG IS LEFT AT +1 BY DAP. THE
 02542  REF   2  LAST  744     26,2417  55'727 0           TS      P63FLAG         -1 ASSURES THAT EXO-ATM DAP WILL NOT
A0253                                                                            CALL P63 OUT OF SEQUENCE IN P66 .

 0255   REF  78  LAST  744     26,2420  0 5301 0  P63.1     TC      PHASCHNG
 0256                           26,2421   00004 0            OCT     00004           DISABLE. DISPLAY RESTARTED VIA ENTRY.

 0257   REF  56  LAST  741     26,2422  0 5112 0           TC      ENDOFJOB

 0258                           26,2423   01474 1  V06N60    VN      0660
 0259                           26,2424   01475 0  V06N61    VN      0661
 0260                           26,2425   01477 1  V06N63    VN      0663
 0261                           26,2426   01500 0  V06N64    VN      0664
 0262   REF   1                26,2427   52000 0  ENTCADR   CADR    STARTENT
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0263   REF   6  LAST  287   E7,1451                    EBANK= RTINIT        TO CARY OVER INTO ENTRY STEERING.
0264   REF   1               26,2430   03375 0  POSECADR 2CADR  CM/POSE
0264   REF   1               26,2431   76067 1
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L P61-P67 USER'S PAGE NO. 9 E6 S3

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R0265   PROGRAM-              P64
R0266   MOD NO.-              1     SEPT. 19, 1967
R0267   MOD BY-               R. HIRSCHKOP
R0268   MOD NO: 2             MOD BY: RR BAIRNSFATHER     DATE:  8 MAY 68     REVISED COMMENTS FOR COLOSSUS
R0270   FUNCTION-             1.  TO START ENTRY GUIDANCE AT .05G SELECTING ROLL  ATTITUDE, CONSTANT DRAG LEVEL, AND
R0272                         DRAG THRESHOLD,  KA  , WHICH ARE KEYED TO THE .05G POINT.
R0274                         2.  SELECT FINAL PHASE P67 IF V < 27000 FPS WHEN .2G OCCURS.
R0276                         3.  ITERATE FOR UP-CONTROL SOLUTION  P65  IF V > 27000 FPS AND IF ALTITUDE RATE AND DRAG
R0278                         LEVEL CONDITIONS ARE SATISFIED. ENTER P65 WHEN CONSTANT DRAG CONTROLLER HAS BROUGHT RANGE
R0280                         AS PREDICTED TO WITHIN 25 NM OF DESIRED RANGE.
R0281                         4.  SELECT FINAL PHASE  P67  IF NO UP-CONTROL SOLUTION EXISTS WITH VL > 18000 FPS.
R0283   CALLING SEQUENCE-     BY RTB FROM REENTRY CONTROL
R0284   EXIT-                 BACK TO REENTRY CONTROL
R0285   SUBROUTINE CALLS-     NEWMODEX

 0286                         26,2432                    BANK   26
 0287   REF   1               26,2000                    SETLOC P60S1
 0288                         26,2432                    BANK

R0289           THIS DISPLAY IS CALLED EACH PASS THROUGH STEERING. RESTART PROTECTION IS VIA STEERING.

 0291   REF   1                                          COUNT* $$/P64

 0292   REF   5  LAST  746    26,2432  0 5243 1  P64     TC     NEWMODEX     ENTER VIA RTB WHEN .05G IS EXCEEDED.
 0293                         26,2433   00100 0          MM     64
 0294   REF   1               26,2434  3 2437 0          CA     V06N68       ROLLC        VI           HDOT
A0295                                                                       XXX.XX DEG   XXXXX. FPS   XXXXX. FPS
 0296   REF   4  LAST  746    26,2435  55'263 0          TS     ENTRYVN      DISPLAY VIA OVERNOUT.

 0297   REF   7  LAST  721    26,2436  0 6030 1          TC     DANZIG       ... AND CONTINUE IN INITROLL ...

 0298                         26,2437   01504 1  V06N68  VN     0668
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P0299   PROGRAM:            P65
R0300   MOD NO:  0          MOD BY:  RR BAIRNSFATHER      DATE:  17 JAN 68     COLOSSUS GSOP ADDITION.
R0302   FUNCTION:           TO CONTINUE ENTRY GUIDANCE, USING THE UP-CONTROL PHASE TO STEER TO A CONTROLLED EXIT
R0304                       CONDITION. THIS PHASE TERMINATES  A) IF D  < Q7 FPSS, GO TO P66   ,
R0306                                                         B) IF RDOT NEG, AND IF V < VL +500FPS, GO TO P67.
R0308
R0309   CALLING SEQUENCE:   BY RTB FROM REENTRY CONTROL
R0310   EXIT:               BACK TO REENTRY CONTROL, OR TO ENDOFJOB.
R0311   SUBROUTINE CALLS:   NEWMODEX

 0312   REF   1                                                  COUNT* $$/P65

 0313   REF  10  LAST  748  26,2440  0 5243 1  P65     TC      NEWMODEX        ENTER VIA RTB WHEN RANGE < 25 N M OF
 0314                       26,2441   00101 1          MM      65              TARGET.

 0315   REF   3  LAST  745  26,2442  3 4760 1          CA      PRIO13
 0316   REF  25  LAST  745  26,2443  0 5027 1          TC      NOVAC
 0317   REF   5  LAST  748     1263                    EBANK=  ENTRYVN
 0318   REF   2  LAST  209  26,2444   02456 1          2CADR   P65.1
 0318                       26,2445   54062 1
 0319   REF  24  LAST  662  26,2446  0 5261 1          TC      2PHSCHNG        2 PHASE CHG REQUIRED TO PREVENT RE-
 0320                       26,2447   00554 0          OCT     00554           STARTING FLASHING DISPLAY TWICE.
 0321                       26,2450   10035 0          OCT     10035           4.55 SPOT AND SERVICER, HERE.
 0322   REF 198  LAST  743  26,2451  0 6006 1          TC      INTPRET
 0323                       26,2452   47131 1          SSP     RTB
 0324   REF   2  LAST  115  26,2453   03646 0                  GOTOADDR        CHANGE ENTRY MODE TO UPCONTRL.
 0325   REF   1             26,2454   53027 1                  UPCONTRL
 0326   REF   1             26,2455   52120 0                  REFAZE10        GO HERE TO REESTABLISH ENTRY SEQUENCER.
A0327                                                                          AND CONTINUE AT UPCONTRL...

 0328   REF  49  LAST  697  26,2456  0 5447 0  P65.1   TC      DOWNFLAG
 0329   REF   2  LAST  744  26,2457   00134 1          ADRES   ENTRYDSP        ENTRYDSP = 920  BIT 13 FLAG 6
A03291
 0330   REF   1             26,2460  3 2472 1          CA      V16N69          ROLLC        DL  (Q7)      VL
 0331   REF 227  LAST  746  26,2461  0 4555 0          TC      BANKCALL        XXX.XX DEG   XXX.XX G     XXXXX. FPS
 0332   REF  18  LAST  740  26,2462   20763 1          CADR    GOFLASHR
 0333                       26,2463  0 2460 1          TC      -3              NODOFLAG IS SET..
 0334                       26,2464  0 2467 0          TC      +3
 0335                       26,2465  0 2460 1          TC      -5
 0336   REF   2  LAST  744  26,2466  0 2232 0          TC      P61.3           EST. GRP 4 FOR DSPLAY AND DO ENDOFJOB
A0337                                                                          IF PROCEED, CONTINUE.
 0338   REF  45  LAST  744  26,2467  0 5435 0          TC      UPFLAG
 0339   REF   3  LAST  749  26,2470   00134 1          ADRES   ENTRYDSP        ENTRYDSP = 920   BIT13 FLAG 6
A03391
 0340   REF   2  LAST  745  26,2471  0 2420 0          TC      P63.1           DISABLE GRP 4,START UP ENTRY DISPLAY

A0341                                                                          NO6V68 VIA OVERNOUT, AS USED IN P64.

 0342                       26,2472   04105 1  V16N69  VN      1669
```

```
P0343   PROGRAM:            P66
R0344   MOD NO:  0          MOD BY:  RR BAIRNSFATHER      DATE:  17 JAN 68     COLOSSUS GSOP ADDITIONS.
R0346   FUNCTION:           KEEP CM ATTITUDE IN TRIM TO THE RELATIVE VELOCITY VECTOR. ENTRY GUIDANCE STOPS GENERATING
R0348                       ROLL COMMANDS UNTIL DRAG BUILDS UP TO  Q7+0.5 FPSS.
R0349
R0350   CALLING SEQUENCE:   VIA RTB FROM REENTRY CONTROL.
R0351   EXIT:               BACK TO REENTRY CONTROL.
R0352   SUBROUTINE CALLS:   NEWMODEX

 0353   REF   1                                                COUNT* $$/P66

 0354   REF  11  LAST  749  26,2473  0 5243 1  P66     TC     NEWMODEX       ENTER VIA RTB WHEN D < Q7 FPSS
 0355                       26,2474   00102 1          MM     66

 0356   REF   3  LAST  744  26,2475  3 4745 0          CA     V06N22         OGA          IGA          MGA
A0357                                                                       XXX.XX DEG   XXX.XX DEG   XXX.XX DEG
 0358   REF   1             26,2476  0 2502 1          TC     P66END         IN CASE CAME FROM P65, GO DISABLE GRP4,
A0359                                                                       AND SET ENTRYDSP TO DO DISPLAY VIA
A0360                                                                       OVERNOUT.
A0361                                                                       ... AND CONTINUE AT KEP2
```

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```
P0362   P67

R0363   PROGRAM-              P67
R0364   MOD NO.-              0     MAR. 16, 1967
R0365   MOD BY-               R. HIRSCHKOP
R0366   FUNCTION-            TO TERMINATE STEERING WHEN THE CM VELOCITY WRT EARTH = 1000 FT/SEC
R0368   CALLING SEQUENCE-
R0369   EXIT-                TC POOH
R0370   SUBROUTINE CALLS-    GOFLASH

R0371           THIS DISPLAY IS CALLED EACH PASS THROUGH STEERING. RESTART PROTECTION IS VIA STEERING.

 0373   REF   1                                          COUNT* $$/P67

 0374   REF  12  LAST  75C   26,2477  0 5243 1  P67     TC      NEWMODEX        ENTER VIA RTB
 0375                        26,2500   00103 C           MM      67
 0376   REF   1              26,2501  3 2510 1           CA      V06N66          ROLLC          XRNGERR        DNRNGERR
A0377                                                                           XXX.XX DEG     XXXX.X NM      XXXX.X NM
 0378   REF   6  LAST  749   26,2502  55'263 C  P66END    TS      ENTRYVN         DISPLAY VIA OVERNOUT.

 0379   REF  46  LAST  749   26,2503  0 5435 C           TC      UPFLAG          (IN CASE CAME FROM P65. ENTRY DISPLAY
 0380   REF   4  LAST  749   26,2504   00134 1           ADRES   ENTRYDSP        WILL FLUSH FLASHING DISP. IF STILL ON)
A0380C                                                                          BIT 13 FLAG 6
 0381   REF  79  LAST  746   26,2505  0 5301 C  KILLGRP4 TC      PHASCHNG        DISABLE GRP4, IN CASE CAME FROM HUNTEST.
 0382                        26,2506   00004 C           OCT     00004           (COME TO KILLGRP4 VIA RTB,RET TO CALLER)

 0383   REF   8  LAST  748   26,2507  0 6030 1           TC      DANZIG          ... AND CONTINUE AT PREDICT3 ...

 0384                        26,2510   01502 1  V06N66    VN      0666

 0385                        26,2511                     BANK    26
 0386   REF   1              26,2000                     SETLOC  P60S2
 0387                        26,2511                     BANK

 0388   REF   1              26,2511  3 2542 C  P67.1     CA      V16N67          RTOGO          LAT            LONG
A0389                                                                           XXXX.X NM      XXX.XX DEG     XXX.XX DEG
 0390   REF 228  LAST  749   26,2512  0 4555 C           TC      BANKCALL
 0391   REF  40  LAST  744   26,2513   20624 C           CADR    GOFLASH
 0392                        26,2514  0 2517 C           TC      +3              EFFECTIVE GOTOPOOH
 0393                        26,2515  0 2517 C           TC      +2
 0394   REF   2  LAST  208   26,2516  0 2511 C           TC      P67.1           REDO

 0395   REF  25  LAST  692   26,2517  4 6214 1           CS      THREE           TURN OFF ENTRY DAP
 0396                        26,2520  0 0004 C           INHINT
 0397   REF   1              26,2521  7 0102 C           MASK    CM/FLAGS        CM/DSTBY , GAMDIFSW
 0398   REF   2  LAST  751   26,2522  54 102 C           TS      CM/FLAGS
 0399                        26,2523  0 0003 1           RELINT
 0400                        26,2524  0 0006 1           EXTEND
 0401   REF   1              26,2525  3 2642 C           DCA     SERVCAD2
```

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```
0402  REF   9  LAST  743   26,2526  53'223 1          DXCH   AVEGEXIT
0403  REF  66  LAST  743   26,2527  1 4106 C          TCF    GOTOPOOH
```

```
0404                                26,2530  43175 0  P67.2    VLOAD   CLEAR      CALC PRESENT LAT, LONG, ALT.
0405  REF  12  LAST  741             26,2531  01171 1                   RN
0406  REF   9  LAST  695             26,2532  00662 0                   ERADFLAG   USE PAD RAD FOR ALT.(NOT SEEN ANYWAY)
0407  REF  11  LAST  727             26,2533  16152 0           STODL   ALPHAV
0408  REF  11  LAST  741             26,2534  01205 1                   PIPTIME    USE TIME OF RN
0409                                26,2535  45014 0           CLEAR   CALL
0410  REF  18  LAST  695             26,2536  01663 0                   LUNAFLAG
0411  REF   5  LAST  695             26,2537  26322 0                   LAT-LONG
0412                                26,2540  77634 0  P67.3    RTB                ENTRY EXIT THAT OMITS DISPLAY.
0413  REF   1                       26,2541  53603 1                   SERVNOUT

0414                                26,2542  04103 1  V16N67   VN      1667
0415  REF   2  LAST  366             4270           OCT41    =       33DEC
0416  REF   1                       26,2641          SERVCAD2 =       SERVCAD1
```

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P0417 SUBROUTINE NAME: S61.1
R0418 MOD NO: 0 DATE: 21 FEB 67
R0420 MOD BY: RR BAIRNSFATHER LOG SECTION: P61-P67
R0422 MOD NO: 1 MOD BY: RR BAIRNSFATHER DATE: 22 JUN 67 RESTARTS.
R0424 FUNCTIONAL DESCRIPTION: CALLED BY BOTH P61 AND P62
R0425 FIRST,TEST TO SEE IF AVERAGEG IS ON. IF NOT, UPDATE THE STATE VECTOR TO PRESENT TIME + TOLERANCE
R0427 AND TURN ON AVERAGEG AT THAT TIME, AND CONTINUE. OTHERWISE CONTINUE: SEE IF IMU Y AXIS IS
R0429 WITHIN 30 DEG OF V*R. IF YES, EXIT SUBROUTINE S61.1. IF NO, SEE IF -Y AXIS OF IMU IS WITHIN
R0431 30 DEG OF V*R. IF YES, DISPLAY ALARM: 01427 IMU REVERSED.
R0432 IF NO, DISPLAY ALARM: 01426 IMU UNSATISFACTORY.
R0434 IN EITHER OF THESE LAST 2 CASES, WAIT 10 SEC AND THEN EXIT SUBROUTINE S61.1.

R0436 REMARK: THERE WILL BE A SHORT 10 SEC DELAY IF AN ALARM EXIT IS TAKEN. THE DELAY FOR INTEGRATION IS
R0438 AS SHORT AS CAN BE MADE, BUT IS ARBITRARY SINCE IT DEPENDS ON THE AGE OF THE STATE VECTOR.

R0440 CALLING SEQUENCE: CALL
R0441 S61.1
R0442 C(MPAC) UNSPECIFIED
R0443 PUSHLOC UNSPECIFIED

R0444 SUBROUTINES CALLED: LOADTIME, CSMPREC, TPAGREE,
R0445 WAITLIST, JOBSLEEP, JOBWAKE, PREREAD, ALARM, GOODSPR, BANKCALL, DELAYJOB
R0447 NORMAL EXIT MODES: RVQ
R0448 ALARMS: 01426 IMU UNSATISFACTORY
R0449 01427 IMU REVERSED
R0450 OUTPUT: POSSIBLE ALARMS
R0451 POSSIBLY TDEC1, RATT, VATT, RN, VN
R0452 ERASABLE INITIALIZATION REQUIRED:
R0453 AVEGFLAG AVERAGEG ON OR OFF LEFT BY SERVICER
R0455 PIPTIME (-28) CS TIME OF PIPA UPDATE LEFT BY READACCS
R0457 RN (-29) M STATE VECTOR LEFT BY AVERAGEG
R0459 VN (-7) M/CS STATE VECTOR LEFT BY AVERAGEG
R0461 REFSMMAT (-1) .5 REF TO SM MATRIX LEFT BY LAST IMU ALIGNMENT
R0463 DEBRIS: QPRET
R0464 POSSIBLY PIPTIME1, RATT, VATT, TDEC1, RN1, VN1, QTEMP, X1 IF UPDATED
R0466 PUSH LIST LOCS USED BY CSMPREC

```
0467  REF  17  LAST  745   E6,1661                EBANK= ACG          FOR 60GENRET , S61DT
0468                       26,2543                BANK   26
0469  REF   1              26,2000                SETLOC P60S3
0470                       26,2543                BANK

0471  REF   1                                     COUNT* $$/S61.1

0472                       26,2543  0 0006 1  S61.1  EXTEND
0473  REF   2  LAST  113   26,2544  23773 0         QXCH   60GENRET     SAVE RET ADDR IN EB 6
0474  REF 229  LAST  751   26,2545  0 4555 0        TC     BANKCALL
0475  REF   7  LAST  692   26,2546   17573 0        CADR   R02BOTH
0476  REF 199  LAST  749   26,2547  0 6006 1        TC     INTPRET
```

```
0477                          26,2550   45014 C            BON     CALR8
0478   REF   2  LAST  504     26,2551   00716 1                    AVEGFLAG       IS AVERAGEG ON
0479   REF   2  LAST  209     26,2552   54603 C                    S61.1A         YES
0480   REF   2  LAST  644     26,2553   27570 C                    MIDTCAV2       GET FUTURE STATE VECTOR SOON AS CAN

0481   REF 276  LAST  735     26,2554   3 0155 C           CA      MPAC +1        RETURN INHINTED ***
0482   REF   3  LAST  208     26,2555   55'774 C           TS      S61DT          FOR RESTART.
0483   REF  35  LAST  661     26,2556   0 5140 1           TC      WAITLIST
0484   REF  11  LAST  529     E7,1431                      EBANK=  DVCNTR
0485   REF   2  LAST  208     26,2557    02564 1           2CADR   S61.1C
0485                          26,2560    54067 1
0486   REF  80  LAST  751     26,2561   0 5301 C           TC      PHASCHNG
0487                          26,2562    40434 C           OCT     40434
0488   REF  97  LAST  746     26,2563   0 5112 C           TC      ENDOFJOB

0489   REF   4  LAST  749     26,2564   3 4760 1  S61.1C   CA      PRIO13
0490   REF  27  LAST  698     26,2565   0 5042 1           TC      FINDVAC
0491   REF  18  LAST  754     E6,1661                      EBANK=  AOG
0492   REF   3  LAST  759     26,2566    02602 1           2CADR   S61.1A -1
0492                          26,2567    54066 C

0493                          26,2570   0 0006 1           EXTEND
0494   REF   2  LAST  753     26,2571   3 2642 C           DCA     SERVCAD1       HE WHO STARTS AVERAGEG MUST SERVICE
0495   REF  10  LAST  752     26,2572   53'223 1           DXCH    AVEGEXIT       THE EXIT.

0496   REF  25  LAST  749     26,2573   0 5261 1           TC      2PHSCHNG
0497                          26,2574    00454 1           OCT     00454
0498                          26,2575    00415 1           OCT     00415

04981  REF   1                26,2576   3 4753 1           CA      EBENTRY        SET E8= 7 FOR PREREAD.
04982  REF  33  LAST  658     26,2577   54 003 C           TS      EBANK

0499   REF  45  LAST  744     26,2600   0 4574 C           TC      POSTJUMP
0500   REF   3  LAST  646     26,2601    76604 1           CADR    PREREAD        PREREAD DOES TC TASKOVER.

0501   REF 200  LAST  754     26,2602   0 6006 1           TC      INTPRET
0502                          26,2603    77204 1  S61.1A   BOVB    VLOAD
0503   REF   2  LAST  287     26,2604    57314 C                    TCDANZIG       TURN OFF OVFIND, IF ON
0504   REF  11  LAST  741     26,2605    01177 1                    VN             VN   (-7) M/CS
0505                          26,2606    64235 1           VXV     MXV
0506   REF  13  LAST  753     26,2607    01171 1                    RN             RN  (-29)  M
0507   REF  28  LAST  728     26,2610    01736 1                    REFSMMAT       .5 UNIT MATRIX
0508                          26,2611    71256 C           UNIT    DLOAD
0509   REF 277  LAST  755     26,2612    00160 C                    MPAC +3        GET  COS(THETA)/2
0510                          26,2613    43240 C           BMN     DAD
0511   REF   1                26,2614    54621 C                    S61.1B         DC TEST ON -YSM
0512   REF   1                26,2615    14644 1                    C(30)LIM       = 1.0 -.5 COS(30)
0513                          26,2616    47004 C           BOVB    RTB
0514   REF   1                26,2617    54640 1                    RETRN1
0515   REF   1                26,2620    54625 1                    RETRN3
```

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0516                          26,2621   43276 C  S61.1B   DCOMP   DAD
0517  REF   2  LAST  755      26,2622   14644 1           C(30)LIM        = 1.0- .5 COS(30)
0518                          26,2623   77404 1           BOVB    EXIT
0519  REF   1                 26,2624   54630 C           RETRN2

0520  REF  30  LAST  719      26,2625   0 5537 C  RETRN3   TC      ALARM
0521                          26,2626    01426 C          OCT     01426          IMU UNSATISFACTORY
0522  REF   2  LAST  756      26,2627   0 2632 1          TC      RETRN2 +2

0523  REF  31  LAST  756      26,2630   0 5537 C  RETRN2   TC      ALARM
0524                          26,2631    01427 1          OCT     01427          IMU REVERSED

0525  REF   4  LAST  694      26,2632   3 4743 C  +2       CAF     V05N09
0526  REF 230  LAST  754      26,2633   0 4555 C           TC      BANKCALL
0527  REF   3  LAST  696      26,2634    20602 1          CADR    GODSPR         DO DISPLAY
0528  REF   1                 26,2635   3 2645 1          CA      10SECS
0529  REF 231  LAST  756      26,2636   0 4555 C          TC      BANKCALL
0530  REF  11  LAST  697      26,2637    01730 1          CADR    DELAYJOB

0531  REF   3  LAST  754      26,2640   0 1773 C  RETRN1   TC      GOGENRET

0532  REF  12  LAST  755      E7,1431                     EBANK=  DVCNTR
0533  REF   4  LAST  654      26,2641    03136 C  SERVCAD1 2CADR   SERVEXIT
0533                          26,2642    76067 1
0534                          26,2643   22111 0  C(30)LIM 2DEC    .566985        = 1.0 -.5 COS(30)
0534                          26,2644   17335 1
0535                          26,2645   01750 1  10SECS   DEC     1000           1000 CS
0536                          26,2646   00000 1  60SECDP  2DEC    6000 B-28      6000 CS
0536                          26,2647   13560 C
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PC537

R0538   PROGRAM NAME:      S61.2                                   DATE:           14 FEB 67
R0540   MOD NO:  1                                                 LOG SECTION:    P61-P67
R0542   MOD BY:  MCRTH / BAIRNSFATHER
R0543   MOD NO:  2           MOD BY:  MCRTH/BAIRNSFATHER   DATE:  11 MAY 67     ADD 2ND ITER FOR ERAD AT 400K FT.
R0545   MOD NO:  3           MOD BY:  RR BAIRNSFATHER      DATE:  21 NOV 67     VARIABLE MU ADDED.
R0547   MOD NO:  4           MOD BY:  RR BAIRNSFATHER      DATE:  21 MAR 68     DIFFERENT EARTH/MOON SCALES IN TFF'S
R0549   FUNCTIONAL DESCRIPTION:      CALLED BY P61.  PROVIDES DISPLAYS FOR NOUNS  N60  AND  N63  .
R0551           PROGRAM CALCULATES ENTRY DISPLAY OF MAXIMUM ACCELERATION EXPECTED  (GMAX)   AND ALSO THE EXPECTED
R0553           INERTIAL VELOCITY (VPRED) AND ENTRY ANGLE  (GAMMAEI)  THAT WILL OBTAIN AT 400K FT ABOVE THE FISCHER
R0555           ELLIPSOID.  PROGRAM ALSO CALCULATES A SECOND DISPLAY RELATIVE  TO THE EMSALT  ABOVE FISCHER ELLIPSOID
R0557           AND CONSISTS OF RANGE TO SPLASH FROM NOW (RTGO) , PREDICTED INERTIAL VELOCITY (VIO) , AND THE TIME TO
R0559           GO FROM NOW (TTE) .
R0560   CALLING SEQUENCE:  CALL
R0561                              S61.2
R0562           C(MPAC) UNSPECIFIED
R0563           PUSHLOC WILL BE SET TO ZERO.

R0564   SUBROUTINES CALLED:  TFFCONIC,  CALCTFF,  TFF/TRIG,  FISHCALC,  GETERAD,  VGAMCALC
R0566   NORMAL EXIT MODES,   RTB   P61.1
R0567   ALARMS:  NONE
R0568   OUTPUT:  THE FOLLOWING REGISTERS ARE WRITTEN IN FOR USE BY DISPLAYS
R0569           GMAX    1GO GMAX  (-14)  G,S       MAXIMUM ACCELERATION
R0570           VPRED   (-7)  M/CS        PREDICTED VELOCITY AT 400K FT
R0571           GAMMAEI   GAMMA/360       PREDICTED GAMMA    AT 400K FT
R0572                                     FOR TM, DP(GAMMAEI) = (GAMMAEI, RTGO) / 360
R0574           RTGO    THETAH/360        RANGE ANGLE TO SPLASH FROM EMSALT        EMSALT IS PAD LOADED
R0576           VIO     (-7) M/CS         INERTIAL VELOCITY  AT      EMSALT        EMSALT IS PAD LOADED
R0578           TTE     (-28) CS          TIME      TO               EMSALT        EMSALT IS PAD LOADED

R0580           PUSHLOC = 0
R0581           CONIC PARAMETERS STORED IN VAC AREA (SEE TFF SUBROUTINES)
R0582   ERASABLE INITIALIZATION REQUIRED:
R0583           RCNE    (-29) M           STATE VECTOR                        LEFT BY USER
R0585           VCNE    (-7)  M/CS        STATE VECTOR                        LEFT BY USER
R0587           UFONE   UR/2                                                  LEFT BY USER
R0589           UNI     (-1)              UNIT NORMAL V*R                     LEFT BY ENTRY / P61
R0591           THETAH  THETAH/360        RANGE ANGLE                         LEFT BY ENTRY / P61
R0593           UNITW   (0)               UNIT POLAR VECTOR                   LEFT BY  PAD LOAD
R0595           EMSALT  (-29) M           EMS INTERFACE ALTITUDE              LEFT BY  PAD LOAD
R0597                                     ORBITAL REENTRY:  284643 FT,  LUNAR REENTRY:  297431 FT.
R0599   DEBRIS:  QFRET,
R0600           ALL PDL LOCATIONS ABOVE 120, INCLUDING X1,X2,S1,S2
R0601           ALSO PDL+0  ...  PDL+5,  WHERE INITIAL PUSHLOC = PDL
```

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P0602

R0603 THE FOLLOWING PUSH LIST LOCATIONS HAVE BEEN RESERVED FOR TFF ROUTINES AND ARE REPEATED HERE FOR CONVENIENCE.

R0605 OF COURSE FOR S61.2 USAGE, EARTH ORIGIN SCALING IS USED.

A0606 BELOW E: IS USED FOR EARTH ORIGIN SCALE
A0607 M: IS USED FOR MOON ORIGIN SCALE

A0608	RTERM	=	18D	TERMINAL RADIUS M E: (-29) M: (-27)
A0609	NRTERM	=	16D	TERMINAL RADIUS M E: (-29+NR)
A0610				M: (-27+NR)
A0611	RMAG1	=	12D	PRESENT RADIUS M E: (-29) M: (-27)
A0612	NRMAG	=	32D	PRESENT RADIUS M E: (-29+NR)
A0613				M: (-27+NR)
A0614	SDELF/2			SIN(THETA) /2
A0615	CDELF/2	=	14D	COS(THETA) /2
A0616	TFFX	=	34D	X, ARGUMENT OF SERIES T(X).
A0617	TFFTEM	=	36D	ARG FOR TRANSFER ANGLE CALCULATION.
A0618	TFFNP	=	28D	LC P M E: (-38+2NR) M: (-36+2NR)
A0619	TFF/RTMU	=	30D	1/SQRT(MU) E: (17) M: (14)
A0620	TFFVSQ	=	20D	-(VN.VN/MU) 1/M E: (20) M: (18)

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P0621

 0622                          34,3654                BANK   34
 0623  REF   2  LAST  751      26,2000                SETLOC P60S2
 0624                          26,2650                BANK

 0625  REF   1                                       COUNT* $$/S61.2

A0626                                                PDL LEFT AT ZERO BY TARGETNG

 0627                          26,2650  45345 1 S61.2 DLOAD  DSU
 06271 REF   1                26,2651  02020 1               EMSALT
 06272 REF   1                26,2652  15000 0               290KFT
 06273                        26,2653  71244 0       BPL     DLOAD
 06274 REF   1                26,2654  54774 1               LUNENT
 0628  REF   1                26,2655  17316 0               1/RTMU      ESTABLISH MU FOR ORBITAL ENTRIES
 06281                        26,2656  77624 1 CALLCON CALL
 0629  REF   1                26,2657  56721 0               TFFCONIC    FILL VAC AREA WITH CONIC PARAMETERS

 0630                          26,2660  45145 0       DLOAD   CALL
 0631  REF   1                26,2661  15020 1               RTRIAL      1 ST GUESS AT TERMINAL RADIUS  (-29)
 0632  REF   2  LAST  512      26,2662  57031 1               CALCTFF     SAVES MPAC IN RTERM  (180)

 0633                          26,2663  77624 1       CALL                CALC SDELF/2,  CDELF/2
 0634  REF   2  LAST  632      26,2664  56573 0               TFF/TRIG    RETURN WITH S(THETA) IN MPAC

 0635                          26,2665  77624 1       CALL                GET FISCHER RADIUS (-29) M
 0636  REF   1                26,2666  55027 1               FISHCALC    ANS IN MPAC AND IN ERADM.

 0637                          26,2667  45015 1       DAD     CALL
 0638  REF   2  LAST  759      26,2670  02020 1               EMSALT
 0639  REF   3  LAST  759      26,2671  57031 1               CALCTFF     SAVES MPAC IN  RTERM  (180)

 0640                          26,2672  77676 0       DCOMP               NEGATIVE AS IN COUNTDOWN.
 0641  REF   3  LAST  742      26,2673  03733 0       STORE   TTE1        DECR TTE FROM BASE TTE1. (RESTART)
A0642                                                                    DNLIST AND DSKY WILL USE TTE.
 0643  REF   6  LAST  742      26,2674  37727 1       STCALL  TTE         LET MISS CONTRL DECR BY ELAPSED TIME
A0644                                                                    TTE= TIME FROM NOW TO EMSALT +FISCHER

 0645  REF   3  LAST  759      26,2675  56573 0               TFF/TRIG    S(THETA) IN MPAC ON RETURNING
A0646                                                                    AND THETA= RANGE FROM NOW TO EMSALT
 0647                          26,2676  77624 1       CALL
 0648  REF   2  LAST  759      26,2677  55027 1               FISHCALC
 0649                          26,2700  77624 1       CALL
 0650  REF   1                26,2701  56626 0               VRCALC
 0651                          26,2702  77624 1       CALL
 06511 REF   1                26,2703  56613 0               DISPTARG
 06512                        26,2704  77624 1       CALL
 06513 REF   2  LAST  759      26,2705  56613 0               DISPTARG
 06514 REF   5  LAST  273      26,2706  37714 1       STCALL  RTGO
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 0652   REF  2 LAST 632   26,2707   55050 1            VGAMCALC

 0653                     26,2710   77605 1     DMP                  MPAC = GAMMA
A0654                                                                 PDLO HAS VGAM.
 0655                     26,2711   43265 1     BDDV   DAD
 0656   REF  1            26,2712   15026 1            VEMSCON        -HS D 180/PI (-14)
 0657                     26,2713   00001 0            0              VGAM FROM PDLO.
 0658   REF  5 LAST 273   26,2714   17725 1     STODL  VIO            PREDICTED VELOCITY AT EMSALT.

A0659                                                  GAMMA AND VGAM AT 300K FT ARE REQUIRED BY  GMAX
A0660                                                  ALGORITHM.

 0661   REF  5 LAST 598   26,2715   02241 1            ERADM          EARTH RADIUS FROM GETERAD     (-29) M
A0662                                                                 = FISCHER RADIUS  (-29)
 0663                     26,2716   77615 0     DAD
 0664   REF  1            26,2717   06462 1            300KFT         M  (-29)
 0665   REF  1            26,2720   34023 1     STCALL RTERM          TERMINAL RADIUS  M  (-29)

 0666   REF  1            26,2721   55045 0            PREVGAM        VGAMCALC WITH NEW RTERM

A0667                                                                 VBAR = (V(FPS)  - 36KF/S) / 20KF/S
R0668    GMAX = (4/(1+ 4.8 VBARSQ))(GAM -6.05 -2.4 VBARSQ) -10(L/D -.3) +10   ASSUME L/D = 0.3, BANK =0.

A0670                                                  GMAXCALC
 0671                     26,2722   45325 1     PDDL   DSU            GAM TO PDL2
 0672                     26,2723   00001 0            0              VGAM IS IN PDL0  (-7)
 0673   REF  1            26,2724   15004 1            36KFT/S        (-7)  M/CS
 0674                     26,2725   63471 0     DDV    DSQ
 0675   REF  1            26,2726   15006 0            20KFT/S        (-6)  M/CS
 0676                     26,2727   00001 0     STORE  0              VBARSQ  (-2)  TO PDL0

 0677                     26,2730   43205 1     DMP    DAD
 0678   REF  1            26,2731   15010 1            KR1
A0679                                                                 GAM,    PCS DOWN, FROM PDL2
 0680                     26,2732   41215 1     DAD    DMP
 0681   REF  1            26,2733   15012 0            -6.05DEG
 0682   REF  1            26,2734   15014 0            KR2
 0683                     26,2735   77725 1     PDDL                 XCH PDL+0 FOR VBARSQ  (-2)
 0684                     26,2736   43271 1     DDV    DAD
 0685   REF  1            26,2737   15024 0            KR4
 0686   REF  1            26,2740   17330 1            DP2(-4)
 0687                     26,2741   77665 1     BDDV
A0688                                                                 NUM FROM PDL+0
 0689                     26,2742   51015 1     DAD    BPL
 0690   REF  1            26,2743   15016 1            KR3
 0691                     26,2744   54747 1            +3
 0692                     26,2745   77745 1     DLOAD
 0693   REF 22 LAST 675   26,2746   15332 1            HI6ZEROS
 0694   REF  3 LAST 273   26,2747   17722 0     STODL  GMAX           100 GMAX  (-14)
```

```
R0695   DISPLAY USES GMAX AS SP, SO LO WORD IS WRITTEN OVER BY VPRED.

 0696   REF   6  LAST  76C   26,2750   02241 1            ERADM     = FISCHER RADIUS  (-29) M
 0697                        26,2751   45015 1     DAD    CALL      2 ND  ITERATION FOR FISCHER RADIUS
 0698   REF   1              26,2752   15022 C            400KFT
 0699   REF   4  LAST  759   26,2753   57031 1            CALCTFF   ESTABLISH TRANSFER ANGLE DATA.
 0700                        26,2754   77624 1     CALL
 0701   REF   4  LAST  759   26,2755   56573 C            TFF/TRIG  GET SIN, COS DELF
 0702                        26,2756   77624 1     CALL
 0703   REF   3  LAST  759   26,2757   55027 1            FISHCALC  GET CORRESPONDING FISCHER RADIUS.

 0704                        26,2760   73015 1     DAD    LXA,2     SAVE HI-WORD FOR DOWNLIST.
 0705   REF   2  LAST  761   26,2761   15022 C            400KFT    M  (-29)
 0706   REF   6  LAST  759   26,2762   03713 1            RTGO      (RANGE ANGLE FROM EMSALT)/360
 0707   REF   2  LAST  76C   26,2763   34023 1     STCALL RTERM
 0708   REF   2  LAST  76C   26,2764   55045 C            PREVGAM   VGAMCALC WITH NEW RTERM

 0709                        26,2765   67076 1     DCOMP  SXA,2     HI-WORD OF EACH ON DOWNLIST.
 0710   REF 278  LAST  759   26,2766   00155 C            MPAC  +1
 0711   REF   5  LAST  273   26,2767   17771 C     STODL  GAMMAEI   CONIC GAMMA/360 AT 400K FT.   ( HI-WORD)
A0712                                                              CONIC RTGO/360 FROM EMSALT    (LOW-WORD)
A0713                                                              FOR TM, DP(GAMMAEI)= (GAMMA, RTGO)/360

A0714                                                              VGAM FROM PDL+0   (-7)
 0715                        26,2770   77626 C            STADR
 0716   REF   6  LAST  273   26,2771   74010 C            STORE     VPRED     CONIC VELOCITY AT 400K FT

 0717                        26,2772   77634 C            RTB
 0718   REF   1              26,2773   54267 C                  P61.1
A0719                                                              PDL BACK TO ZERO.

07192                        26,2774   52145 C  LUNENT    DLOAD    GOTO
07193   REF   3  LAST  508   26,2775   06456 C                     1/RTMUE   ESTABLISH MU FOR LUNAR TYPE ENTRIES
07194   REF   1              26,2776   54656 C                     CALLCON
07195                        26,2777   00002 C  290KFT     2DEC     88392.0 B-29
07195                        26,3000   26244 1
07196                        26,3001   00052 C  KTETA1     2DEC*    .421844723 E2 B-14*      1100 2PI/16384(163.84)
07196                        26,3002   05716 1
 0720                        26,3003   33335 1  36KFT/S    2DEC     109.728 B-7      (-7) M/CS = 36 KFT/S (-7)
 0720                        26,3004   05707 1
 0721                        26,3005   36365 1  20KFT/S    2DEC     121.92 B-7       (-6) M/CS  = 2 20KFT/S  (-7)
 0721                        26,3006   30244 C
 0722                        26,3007   77113 1  KR1        2DEC     -.026666667      =- 2.4  4 / 360
 0722                        26,3010   42770 1
 0723                        26,3011   77354 C  -6.05DEG   2DEC     -.016805556      = -6.05 / 360
 0723                        26,3012   65030 1
 0724                        26,3013   21450 C  KR2        2DEC     .54931641        =(360/4) 100 (-14) =  9000 B-14
 0724                        26,3014   00001 C
 0725                        26,3015   01750 1  KR3        2DEC     1000  B-14       = 100  (10.0)  (-14)   G,S
 0725                        26,3016   00000 1
```

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A0726                                                                ASSUMES L/D = 0.3, BANK =0.
 0727                    26,3017   00305 1  RTRIAL   2DEC   6460097.18 B-29  RPAD +284643 FT =21 194 545 FT
 0727                    26,3020   04541 C
A0728                                                  RPAD DEFINED AS 20 909 901.57 FT =6 373 338 M
 0729                    26,3021   00003 1  400KFT   2DEC   121920 B-29      METERS
 0729                    26,3022   27040 C

R0730  300KFT  2DEC  91440 B-29      (-29)  M

R0731  ENSALT  2DEC  86759.2 B-29    284643 FT (-29) M    (ORBITAL REENTRY)

R0732  ENSALT  2DEC  90657 B-29      297431 FT (-29) M    (LUNAR REENTRY)

 0733                    26,3023   32525 1  KR4      2DEC   .833333333
 0733                    26,3024   12525 C
 0734  REF  3 LAST 508   23,2461             300KFT   EQUALS MINPERE
 0735                    26,3025   77777 C  VEMSCON  2DEC   -.0389676 B-14   = -HS D  /2  PI  (-14)    M SQ/ CS SQ
 0735                    26,3026   76601 1
A0736                                                        =- 16369   .050  32.2  .3048  .3048/2 PI    (-14)
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R0737   SUBROUTINE NAME:   FISHCALC              (USED BY  S61.2)          DATE:          01.21.67
R0739   MOD NO:  0                                                          LOG SECTION:   P61-P67
R0741   MOD BY:  NORTH / BAIRNSFATHER
R0742   MOD NO:  1            MOD BY:  RR BAIRNSFATHER      DATE:  11 MAY 67     INCLUDE  GETERAD  CALL
R0744   FUNCTIONAL DESCRIPTION:  GIVEN THE PRESENT POSITION, UNITR, CALCULATE A  NEW UNITR THAT IS ROTATED THROUGH
R0746           TRANSFER ANGLE, THETA, ALONG TRAJECTORY. THEN CALCULATE  SIN(LAT)  AND USE TO OBTAIN FISCHER RADIUS.

R0748           SINCE FISHCALC USES UNI (LEFT BY ENTRY) EARTH SCALING IS ASSUMED.(WILL IMPROVE FOR SUITABLE TENNANT)

R0750   CALLING SEQUENCE:  CALL
R0751                            FISHCALC
R0752           ENTER WITH .5 SIN(THETA) IN MPAC.
R0753           PUSHLOC IS AT PDL+0, AN ARBITRARY BASE VALUE IF LEQ 8D

R0754   SUBROUTINES CALLED:  GETERAD
R0755   NORMAL EXIT MODE:    RVQ
R0756   EXIT MODES:           NONE
R0757   OUTPUT:  ERADM  (-29) M   IN MPAC ON RETURNING
R0758           NEW UNIT VECTOR NOT SAVED.
R0759           SIN(LAT) NOT SAVED.
R0760           PUSHLOC AT PDL+0
R0761   ERASEABLE INITIALIZATION REQUIRED:
R0762           SDELF/2     =SIN(THETA) /2,   IN MPAC                    LEFT BY TFF/TRIG
R0764           CDELF/2     =COS(THETA) /2, STORED IN PDL 14D            LEFT BY TFF/TRIG
R0766           RONE   (-29) M                                           LEFT BY USER
R0768           VONE   (-7)  M/CS                                        LEFT BY USER
R0770           URONE  UR/2                                              LEFT BY USER
R0772           UNI          .5 UNIT( V*R)                               LEFT BY ENTRY / P61
R0774           UNITN        UNIT NORTH POLE                             LEFT BY PAD LOAD
R0776   DEBRIS:  QPRET,    PDL+0 ... PDL+5
R0777

A0778                                                                    -      -          -
 0779                          26,3027   47315 0  FISHCALC PDVL   VXV   URPR = UR CDELF + UHOR SDELF
 0780   REF  3  LAST  741     26,3030   02343 1                   URONE
 0781   REF  3  LAST  741     26,3031   03502 0                   UNI
 0782                          26,3032   76561 1           VXSC    VSL1
A0783                                                               SIN(THETA) /2 FROM PDL+0
 0784                          26,3033   74315 0           PDVL    VXSC   TO PDL+0,  +5
 0785   REF  4  LAST  763     26,3034   02343 1                   URONE
 0786   REF  2  LAST  632     26,3035   00017 1                   CDELF/2   COS(THETA) /2
 0787                          26,3036   45455 1           VAD     STADR
 07871  REF  1                26,3037   74235 0           STORE   URH     FOR USE IN RTGO FROM EMS DISPLAY
 0788                          26,3040   72441 0           DOT     SL1
 0789   REF  7  LAST  527     26,3041   01714 1                   UNITN   FULL UNIT VECTOR    UNIT NORTH
 0790   REF 12  LAST  753     26,3042   02156 1           STORE   ALPHAV +4   = .5 SIN(LAT)
 0791                          26,3043   77650 1  DUMPFISH GOTO
 0792   REF  2  LAST  616     26,3044   26437 0                   GETERAD   SAVES FISCHER RAD (-29) M IN ERADM AND
A0793                                                               IN MPAC. RETURNS TO CALLER VIQ QPRET.
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R0794   SUBROUTINE NAME:   VGAMCALC              (USED BY  S61.2)          DATE:          01.21.67
R0796   MOD NO:    0                                                       LOG SECTION:   P61-P67
R0798   MOD BY:  MCRTH / BAIRNSFATHER
R0799   MOD NO:  1          MOD BY:  RR BAIRNSFATHER     DATE:  11 APR 67
R0800   MOD NO:  2          MOD BY:  RR BAIRNSFATHER     DATE:  21 NOV 67    VARIABLE MU ADDED.
R0802   MOD NO:  3          MOD BY:  RR BAIRNSFATHER     DATE:  21 MAR  68   ACCEPT DIFFERENT EARTH/MOON SCALE
R0804   FUNCTIONAL DESCRIPTION:      EARTH CENTERED VIS VIVA CALCULATION OF TERMINAL VELOCITY AND GAMMA (REL TO
R0806           HORIZONTAL)  GIVEN  THE SCALAR QUANTITIES:   PRESENT RADIUS AND VELOCITY AND THE TERMINAL RADIUS.
R0808           THE USER MUST APPEND PROPER SIGN TO GAMMA, SINCE IT IS CALCULATED AS A POSITIVE NUMBER.
R0810           THE EQUATIONS ARE

R0811                   VGAM = SQRT(VN VN/MU + 2(RN-RTERM)/(RN RTERM)  )  RTMU

R0812                   COSGAM = H /RTERM VGAM  = SQRT(LCP)/ (RTERM VGAM/RTMU)


R0813           VGAMCALC ASSUMES THAT THE TERMINAL RADIUS IS LESS THAN THE PRESENT RADIUS. BOTH CALCTFF AND CALCTPER
R0815           MAKE THIS ASSUMPTION.

R0816   CALLING SEQUENCE:  CALL                          STCALL RTERM
R0817                           VGAMCALC                        PREVGAM
R0818           PUSHLOC AT PDL+0, ARBITRARY  IF LEQ 120
R0819           C(MPAC) UNSPECIFIED                  C(MPAC)=NEW RTERM

R0820   SUBROUTINES CALLED:  NONE
R0821   NORMAL EXIT MODE:    RVQ
R0822   ALARMS:    NONE
R0823   OUTPUT:    GAMMA / 360 IN MPAC, POSITIVE NUMBER
R0824            VGAM E:(-7)  M:(-5)    M/CS  IN PDL+0
R0825            PUSHLOC AT PDL+2
R0826   ERASABLE INITIALIZATION REQD:
R0827           TFF/RTMU E:(17) M:(14)   1/SQRT(MU)                              LEFT BY TFFCONIC.
R0829           RMAG1  E:(-29) M:(-27)   M   PRESENT RADIUS LENGTH              LEFT BY TFFCONIC
R0831           NRMAG  E: (-29+NR)       M  NORM LENGTH OF PRESENT POSITION    LEFT BY TFFCONIC
R0833                  M: (-27+NR)
R0834           RTERM  E:(-29) M:(-27)   M  TERMINAL RADIUS LENGTH              LEFT BY CALCTFF
R0836           NRTERM E: (-29+NR)       M  NORM LENGTH OF TERMINAL RADIUS     LEFT BY CALCTFF
R0838                  M: (-27+NR)
R0839           TFFVSQ E:(20)  M:(18)  1/M   -(V SQ/MU): PRESENT VELOCITY,NORM LEFT BY TFFCONIC
R0841           TFFNP  E: (-38+2NR)      M  LCP, SEMI-LATUS RECTUM, WEIGHT NR  LEFT BY TFFCONIC
R0843                  M: (-36+2NR)
R0844   DEBRIS:  QPRET,   PDL+0 ... PDL+3
R0845           RTERM,  NRTERM  IF PREVGAM ENTERED.
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L P61-P67 USER'S PAGE NO. 26 E6 S3

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P0846
 0847                          26,3045   77657 C  PREVGAM  SL*              ENTER WITH NEW  RTERM IN MPAC
A0848                                                                       E: (-29)  M: (-27)
 0849                          26,3046   20201 C                 0,1        X1 = -NR
 0850  REF   1                26,3047   00021 1           STORE NRTERM     RTERM  M        E:(-29+NR)   M:(-27+NR)

 0851                          26,3050   41345 C  VGAMCALC DLOAD  DMP
 0852  REF   1                26,3051   00041 1                 NRMAG      RMAG  M        E:(-29+NR)   M:(-27+NR)
 0853  REF   2  LAST  765     26,3052   00021 1                 NRTERM     RTERM  M       E:(-29+NR)   M:(-27+NR)
 0854                          26,3053   45325 1           PDDL  DSU        RMAG RTERM M   E:(-58+2NR) M:(-54+2NR)
 0855  REF   2  LAST  765     26,3054   00041 1                 NRMAG      RMAG  M        E:(-29+NR)   M:(-27+NR)
 0856  REF   3  LAST  765     26,3055   00021 1                 NRTERM     RTERM  M       E:(-29+NR)   M:(-27+NR)
 0857                          26,3056   56257 1           SL*   DDV        2(RN-RTERM)    E:(-30+NR)   M:(-28+NR)
 0858                          26,3057   20171 1                 0 -8D,1    (-8+NR)
A0859                                                                       PUSH UP PRODUCT.
 0860                          26,3060   77625 C           DSU
 0861  REF   1                26,3061   00025 C                 TFFVSQ     -(V SQ/MU)          E: (20)   M: (18)
 0862                          26,3062   41566 1           SQRT  PUSH       SAVE VGAM/RT(MU) FOR NOW. E:(10) M:(9)
 0863                          26,3063   65271 C           DDV   PDDL       XCH PDL+0, LEAVING VGAM FOR OUTPUT.
A0864                                                                       VGAM TO PDL M/CS   E: (-7)   M: (-2)
 0865  REF   4  LAST  508     26,3064   00037 C                 TFF/RTMU   E: (17)  M: (14)
 0866                          26,3065   65205 C           DMP   PDDL       RTERM VGAM/RTMU  E:(-19+NR)  M:(-18+NR)
 0867  REF   4  LAST  765     26,3066   00021 1                 NRTERM     RTERM  M        E:(-29+NR)   M:(-27+NR)
 0868  REF   1                26,3067   00035 1                 TFFNP      LC P =H.H/MU  M E:(-38+2NR) M:(-36+2NR)
 0869                          26,3070   56366 1           SQRT  DDV                      E:(-19+NR)   M:(-18+NR)
A0870                                                                       PUSH UP DEN      E:(-19+NR)   M:(-18+NR)
A08701                                                                      USE DDV OVFL AS LIMITER (|COS| <1.0)
 0871                          26,3071   65542 1           SR1   ACOS
 0872                          26,3072   77616 C  DUMPVGAM RVQ

A0872                                                                       CALLER MUST SUPPLY OWN SIGN ...

A0873                                                                                                  22W      27MS
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P0874   SUBROUTINE NAME:      TFF/TRIG              (USED BY  S61.2)              DATE      01.17.67
R0876   MOD NO:  0                                                               LOG SECTION:    P61-P67
R0878   MOD BY:  RR BAIRNSFATHER
R0879   MOD NO:  1             MOD BY:  RR BAIRNSFATHER      DATE:  14 APR 67
R0880   MOD NO:  2             MOD BY:  RR BAIRNSFATHER      DATE:  21 MAR  68    ACCEPT DIFFERENT EARTH/MOON SCALE
R0882   FUNCTIONAL DESCRIPTION:      USED BY ENTRY DISPLAY TO CALCULATE SIN(THETA), COS(THETA) FROM DATA LEFT IN
R0884           PDL BY TFF SUBROUTINES. THE EQNS ARE
R0885                   COS(THETA) = 1-2 ABS(ARG) /(RN RTERM (1+X)  )
R0886                                                 2
R0887                   SIN(THETA) = SGN(ARG) SQRT(1-COS (THETA) )
R0888           WHERE  THETA = TRANSFER ANGLE
R0889           AND    ARG = P Z ABS(Z)                                         IF ALFA ZZ   LEQ 1
R0891                  ARG = (P / ALFA)  SGN(C1 + R 1/Z)                        IF ALFA Z Z   G  1
R0893           AND  ARG  HAS BEEN AFFIXED WITH THE SIGN OF SIN(THETA).
R0894   CALLING SEQUENCE:  CALL
R0895                           TFF/TRIG
R0896           PUSHLOC AT PDL+0, ARBITRARY IF NOT EQ 140
R0897           C(MPAC) UNSPECIFIED

R0898   SUBROUTINES CALLED:  NONE
R0899   NORMAL EXIT MODES:   RVQ
R0900   ALARMS:  NONE
R0901   OUTPUT:  C(MPAC) = .5 SIN(THETA)
R0902           CDELF/2 = .5 COS(THETA)          (IN PDL 140)
R0903           PUSHLOC AT PDL+0
R0904   ERASABLE INITIALIZATION REQUIRED:
R0905           TFFX                X                                           LEFT BY CALCTFF OR CALCTPER
R0907           TFFTEM E: (-59+2NR) ARG                                         LEFT BY CALCTFF OR CALCTPER
R0909                  M: (-55+2NR) WHERE ARG = LOP ZZ SGN(DELF) OR ARG = LOP/ALFA  SGN(DELF)
R0911           NRTERM E: (-29+NR)    M  NORM LENGTH OF TERMINAL RADIUS         LEFT BY CALCTFF OR CALCTPER
R0913                  M: (-27+NR)
R0914           NRMAG  E: (-29+NR)    M  NORM LENGTH OF PRESENT POSITION        LEFT BY TFFCONIC
R0916                  M: (-27+NR)
R0917   DEBRIS:  QPRET, CDELF/2
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 09172                          27,2573                  BANK   27
 09173  REF   1                 27,2000                  SETLOC P60S5
 09175                          27,2573                  BANK
 0918                           27,2573   70545 1  TFF/TRIG DLOAD  SR1
 0919   REF   1                 27,2574   00043 C          TFFX
 0920                           27,2575   41215 1  DAD     DMP
 0921   REF   8  LAST  633      27,2576   15330 C          HIDPHALF
 0922   REF   3  LAST  765      27,2577   00041 1          NRMAG          RMAG  M          E:(-29+NR)  M:(-27+NR)
 0923                           27,2600   55205 C  DMP     BDDV
 0924   REF   5  LAST  765      27,2601   00021 1          NRTERM         RTERM  M         E:(-29+NR)  M:(-27+NR)
 0925   REF   1                 27,2602   00045 C          TFFTEM         P ZSQ OR P/ALFA  E:(-59+2NR) M:(-55+2NR)
 0926                           27,2603   44246 1  ABS     BDSU           THE SIGN IS FOR SDELF.
 0927   REF   9  LAST  766      27,2604   15330 C          HIDPHALF
 0928   REF   3  LAST  763      27,2605   00017 1  STORE   CDELF/2        .5 COS(THETA)
 0929                           27,2606   57516 1  DSQ     DCOMP          KEEP HONEST FOR SQRT.
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0930                          27,2607  75415 C            DAD     SQRT
0931   REF   1                27,2610  15322 C                    HIDP1/4
0932                          27,2611  43565 C  DUMPTRIG SIGN    RVQ
0933   REF   2  LAST  766     27,2612  00045 C                    TFFTEM      AFFIX SIGN(CELE/2)
A0934                                                              RETURN WITH .5 SIN(THETA) IN MPAC

A0935                                                                    16W          15 MS

0936                          27,2613  77620 C  DISPTARG STQ               C(MPAC) = TRGO  ESTIMATE
0937   REF   4  LAST  756     27,2614  03373 C                    GOGENRET
0939                          27,2615  45205 1            DMP     DSU
0940   REF   1                27,2616  15002 1                    KTETA1
0944   REF   4  LAST  759     27,2617  03733 C                    TTE1
0945   REF   6  LAST  287     27,2620  37606 C            STCALL  DTEARCT
0946   REF   2  LAST  287     27,2621  46225 C                    EARRCT2
0947                          27,2622  77624 1            CALL
0948   REF   2  LAST  759     27,2623  56626 C                    VRCALC
0949                          27,2624  77650 1            GOTO
0950   REF   5  LAST  767     27,2625  03373 C                    GOGENRET
0951                          27,2626  50375 0  VRCALC    VLOAD   DOT
0952   REF   2  LAST  763     27,2627  03542 1                    URH
0953   REF   3  LAST  287     27,2630  03474 C                    RT
0954                          27,2631  65512 1            SL2     ACCS
0956                          27,2632  77616 C            RVQ
R0957  END OF PROGRAM  S61.2
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R0958
R0959   PROGRAM DESCRIPTION S62.3        DATE 10JAN67
R0960   MOD NO 1          LOG SECTION P60-P67
R0961   MOD BY ZELDIN
R0962   MOD NO:  2              MOD BY:  RR BAIRNSFATHER      DATE: 15 MAY 67      CHANGED TO REF COORDS.
R0964   MOD NO:  3              MOD BY:  RR BAIRNSFATHER      DATE:  17 JAN 68     ALFAPAD CHANGES MADE.
R0966   FUNCTIONAL DESCRIPTION
R0967           COMPUTE  DESIRED GIMBOL ANGLES FOR ENTRY ATTITUDE
R0968           THE FOLLOWING TRAJECTORY TRIAD IS AVAILABLE IN MEMORY AND IS COMPUTED EACH 2 SECONDS BY  CM/POSE  IN
R0970           REFERENCE COORDINATES (V = VELOCITY RELATIVE TO EARTH) :

R0971                   UXA = -UNIT(V)
R0972                   UYA =  UNIT(V*R)
R0973                   UZA =  UXA*UYA

R0974           GENERATE A DESIRED BODY TRIAD FOR TRIMMED FLIGHT WITH RESPECT TO THE RELATIVE VELOCITY VECTOR, USING
R0976           ROLL COMMAND AND TRIM ANGLE OF ATTACK:

R0977                   UXD = UNIT(UYD*UXA) SIN(ALFATRIM) + UXA COS(ALFATRIM)
R0978                   UYD = UYA COS(ROLLC) + UZA SIN(ROLLC)
R0979                   UZD = UXD * UYD

R0980           USE THE DESIRED SET (IN REFERENCE COORDS) AND  REFSMMAT  TO CALL   CALCGA   AND OBTAIN GIMBAL ANGLES
R0982           IN 2S,C IN MPAC, +2 AND THETAD, +2.

R0983   CALLING SEQUENCE
R0984           L   CALL
R0985         L+1         S62.3
R0986   NORMAL EXIT MODE
R0987           RETURN VIA QPRET DIRECTLY FROM CALCGA.
R0988   SUBROUTINES CALLED
R0989           CALCGA
R0990   ALARM OR ABORT MODES
R0991           NONE
R0992   ERASABLE INITIALIZATION REQUIRED
R0993           ROLLC  ROLL COMMAND                          DP 1:S COMP AT IREV
R0994           ALFAPAD   SP 1S,C      /180                    LEFT BY PAD LOAD    ALFATRIM IS NEGATIVE.
R0996           UXA/2  REF COORDS                            LEFT BY CM/POSE
R0997           UYA/2  REF COORDS                            LEFT BY CM/POSE
R0998           UZA/2  REF COORDS                            LEFT BY CM/POSE
R0999   OUTPUT
R1000           CPHI   GIMBAL ANGLES (O,I,M) 2:S COMP TP (O,I,M)/180
R1001   DEBRIS
R1002         CTEMP, QPRET,PUSHLIST
R1003

 1004                           10,2302                      BANK   10
 1005   REF   1                 10,2000                      SETLOC P60S4
 1006                           10,2302                      BANK
```

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 1007   REF   1                                        COUNT* $$/S62.3

 1008                        10,2302  67201 C  S62.3   SETPD  SLOAD
 1009                        10,2303  00001 C          0
 1010   REF   2  LAST  744   10,2304  03012 1          ALFAPAD   ALFATRIM /180 , ALFA IS NEG.
 1011                        10,2305  41542 1  SR1     PUSH
 1012                        10,2306  65346 C  COS     PDDL      XCH PDL, CCS TO PDL0
 1013                        10,2307  65356 1  SIN     PDDL      SIN TO PDL2
 1014   REF   7  LAST  744   10,2310  03316 C          RCLLC
 1015                        10,2311  74346 C  COS     VXSC
 1016   REF   2  LAST  115   10,2312  03550 1          UYA/2                          REF COORDS
 1017                        10,2313  73525 1  PDDL    SIN       PUSH VECTOR INTO PDL4,.9
 1018   REF   8  LAST  769   10,2314  03316 C          RCLLC
 1019                        10,2315  53361 C  VXSC    VAD
 1020   REF   2  LAST  115   10,2316  03556 1          UZA/2                          REF COORDS
A1021                                                                VECTOR FROM PDL4, 9
 1022                        10,2317  77772 C  VSL1
 1023   REF   5  LAST  715   10,2320  02722 1  STORE   YNB       = UYC                REF COORDS

 1024                        10,2321  76435 1  VXV     VSL1
 1025   REF   3  LAST  115   10,2322  03542 1          UXA/2                          REF COORDS
 1026                        10,2323  65361 C  VXSC    PDDL
A1027                                                                SIN TRIM FROM PDL2
A1028                                                                XCH PDL0 FOR COS TRIM
 1029                        10,2324  53361 C  VXSC    VAD
 1030   REF   4  LAST  769   10,2325  03542 1          UXA/2                          REF COORDS
A1031                                                                FROM PDL0
 1032                        10,2326  77626 C  STADR
 1033   REF   9  LAST  725   10,2327  75063 C  STORE   XNB       X SC AXIS (.5 UNIT)    REF COORDS

 1034                        10,2330  76435 1  VXV     VSL1
 1035   REF   6  LAST  769   10,2331  02722 1          YNB
 1036   REF   6  LAST  715   10,2332  26730 1  STOVL   ZNB       Z SC IN REF COOR. SCALED AT 2
 1037   REF  29  LAST  755   10,2333  01736 1          REFSMMAT
 1038   REF  33  LAST  725   10,2334  26672 C  STOVL   XSM
 1039   REF  30  LAST  769   10,2335  01744 1          REFSMMAT +6
 1040   REF   4  LAST  434   10,2336  26700 1  STOVL   YSM
 1041   REF  31  LAST  769   10,2337  01752 C          REFSMMAT +12D
 1042   REF   3  LAST  434   10,2340  02706 1  STORE   ZSM

 1043                        10,2341  52014 C  CLEAR   GOTO
 1044   REF   1              10,2342  00260 C          CPHIFLAG  CAUSE CALCGA TO STORE ANS IN TP CPHI
 1045   REF   3  LAST  725   10,2343  47244 C          CALCGA
A1046                                                                CALCGA WILL RETURN TO ORIGINAL CALLER
A1047                                                                VIA QPRET WITH 2,S COMP. ANGLES IN CPHI
```

R0001 PROGRAM NAME - PREREAD, READACCS, SERVICER, AVERAGE G.

R0002 MCD NO. 0C BY P.HAMILTON DEC.12, 1966

R0003 FUNCTIONAL DESCRIPTION

R0004 THE ROUTINES DESCRIBED BELOW ARE USED TO CALCULATE VALUES OF RN, VN, AND GDT/2 DURING ACCELERATED FLIGHT.
R0006 THE SEVERAL ROUTINES COMPRISE A PACKAGE AND ARE NOT MEANT TO BE USED AS SEPARATE SUBROUTINES.

R0008 GENERAL REFERENCES TO SERVICER OR AVERAGE G ARE UNDERSTOOD TO REFER TO THE ENTIRE SET OF ROUTINES INCLUDING
R0010 READACCS, SERVICER, AVERAGE G, INTEREAD, SMOOTHER, AND ANY ADDITIONAL ROUTINES ATTACHED AT AVGEXIT (SEE BELOW).

R0012 PROGRAMS INITIATING SERVICER ARE REQUIRED TO MAKE A WAITLIST CALL FOR PREREAD (OR, IF LIFTOFF, FOR BIBIBIAS)
R0014 AT 2 SECONDS BEFORE THE FIRST AVERAGE G UPDATE IN ORDER TO INITIALIZE THE SEQUENCE, WHICH WILL RECUR EVERY
R0016 2 SECONDS FROM THAT TIME ON AS LONG AS AVEGFLAG REMAINS SET.

R0017 THE USE OF ERASABLE AVGEXIT ALLOWS VARIOUS ROUTINES TO BE PERFORMED AS PART OF THE NORMAL CYCLE (SEE
R0019 EXPLANATION OF AVGEXIT BELOW).

R0020 DESCRIPTIONS OF INDIVIDUAL ROUTINES FOLLOW.

R0021 PREREAD

R0022 PREVIOUSLY EXTRAPOLATED VALUES COPIED FROM RN1, VN1, AND PIPTIME1 INTO RN, VN, AND PIPTIME.
R0024 LASTBIAS JOB SCHEDULED.
R0025 PIPS READ AND CLEARED VIA PIPASR SUBROUTINE.
R0026 AVERAGE G FLAG SET ON.
R0027 DRIFT FLAG SET OFF.
R0028 V37 FLAG SET ON.
R0029 INITIALIZATION OF 1) THRUST MONITOR (DVMON) - DVCNTR SET TO ONE.
R0031 2) TOTAL ACCUMULATED DELV VALUE (DVTOTAL) - SET TO ZERO.
R0033 3) AXIS VECTOR (AXIS) - SET TO (.5,0,0).
R0034 NORMLIZE JOB SCHEDULED.
R0035 READACCS TASK CALLED IN 2 SECONDS.

R0036 NORMLIZE

R0037 GDT/2 INITIALIZED VIA CALCGRAV SUBROUTINE.

R0038 READACCS

R0039 IF CNMON FLAG SET QUIKREAD ROUTINE IS PERFORMED BEFORE PIPASR ZEROS THE PIPA REGISTERS, AND THE 1/2 SEC
R0041 CMMONITOR LOOP IS INITIATED TO PROVIDE DOWNLINK INFORMATION DURING ENTRY.
R0043 PIPS READ AND CLEARED BY PIPASR SUBROUTINE.
R0044 IF CM/DSTBY IS ON, ENTRY VARIABLES INITIALIZED AND SETJTAG TASK CALLED.

R0047 IF AVERAGEG FLAG ON READACCS CALLED TO RECYCLE IN 2 SECONDS.
R0048 IF AVERAGEG FLAG OFF AVERAGE G EXIT (AVGEXIT) SET TO 2CADR AVGEND FOR FINAL PASS.
R0050 SERVICER JOB SCHEDULED.

R0051 TEST CONNECTOR OUTBIT TURNED ON.

R0052 CNMNITOR

R0053 A SEQUENCE OF THREE PASSES THROUGH QUICKREAD FOLLOWING A CALL TO READACCS WITH CNMONFLG SET AT 1/2
R0055 SEC INTERVALS. INTERVALS ARE COUNTED OUT BY PIPCTR, INITIALISED AT 3 BY READACCS

R0057 QUIKREAD

R0058 READS CURRENT PIPS INTO X,Y,ZPIPBUF. READS OLD X,Y,ZPIPBUF INTO X,Y,ZOLDBUF. VALUES ARE SENT TO
R0060 DOWNLIST DURING ENTRY.
R0061 SERVICER
R0062 DELV VALUES CHECKED TO DETECT RUNAWAY PIP -
R0063 IF BAD PIP 1) ALARM SENT.
R0064 2) COMPENSATION, DVTOTAL ACCUMULATION, AND DVMON BYPASSED. CONTROL
R0066 TRANSFERRED TO AVERAGE G.
R0067 PIPS COMPENSATED VIA 1/PIPA SUBROUTINE.
R0068 DVTOTAL INCREMENTED BY ABSOLUTE VALUE OF DELV.
R0069 THRUST MONITOR (DVMON) PERFORMED UNLESS IDLE FLAG IS ON.
R0070 CONTROL TRANSFERRED TO AVERAGE G.

R0071 DVMON

R0072 THRESHOLD VALUE (PLACED IN DVTHRUSH BY USER) CHECKED AGAINST ABSOLUTE VALUE OF DELV TO CHECK
R0074 THRUST LEVEL.
R0075 IF THRUST 1) ULLAGE OFF ROUTINE PERFORMED.
R0076 2) STEERING FLAG TURNED ON AT FIRST DETECTION OF THRUST.
R0078 3) CONTROL TRANSFERRED TO AVERAGE G.
R0079 IF NO THRUST 1) ON FIRST PASS THROUGH MONITOR, CONTROL TRANSFERRED TO AVERAGE G.
R0081 2) ON SUBSEQUENT PASSES, CONTROL TRANSFERRED TO ENGINE FAIL ROUTINE IF THRUST
R0083 HAS FAILED FOR 3 CONSECUTIVE PASSES.

R0084 ENGINE FAIL

R0085 ENGFAIL1 TASK CALLED IN 2.5 SECONDS. THIS WILL RETURN CONTROL TO TIG-5 SO THAT THE IGNITION
R0087 SEQUENCE MAY BE REPEATED.
R0088 ENGINOF3 PERFORMED.
R0089 DAP SET UP FOR RCS.

R0090 AVERAGE G

R0091 RN1, VN1, GDT1/2 CALCULATED VIA CALCRVG ROUTINE BY UPDATING RN, VN WITH DELV AND AN AVERAGED VALUE
R0093 OF GDT/2.
R0094 RN1, VN1, GDT1/2, PIPTIME1 COPIED INTO RN, VN, GDT/2, PIPTIME FOR RESTART PROTECTION.
R0096 CONTROL TRANSFERRED TO ADDRESS SPECIFIED BY USER (OR BY READACCS FOR LAST PASS) IN AVGEXIT.
R0098 LAST PASS (AVGEND) 1) FREE FALL GYRO COMPENSATION SET UP.
R0099 2) DRIFT FLAG TURNED ON.
R0100 3) STATE VECTOR TRANSFERRED VIA AVETOMID ROUTINE.
R0102 4) CNMONITOR FLAG RESET.
R0103 5) V37 FLAG RESET.
R0104 6) TEST CONNECTOR OUTBIT RESET.
R0105 7) CONTROL TRANSFERRED TO CANV37 TO CONTINUE MM CHANGE ROUTINE (R00).

R0108 CALLING SEQUENCE

R0109 PREREAD ENTERED DIRECTLY FROM TIG-30 VIA POSTJUMP.
R0110 READACCS CALLED AS WAITLIST TASK.

R0112 SUBROUTINES CALLED

R0113 UTILITY ROUTINES - PHASCHNG FLAGUP FLAGDOWN NOVAC FINDVAC WAITLIST ALARM NEWPHASE 2PHSCHNG

R0115 OTHER - PIPASR 1/PIPA CALCGRAV CALCRVG AVETOMID

R0116 NORMAL EXIT MODES

R0117 ENDOFJOB TASKOVER CANV37

R0118 AVGEXIT - THIS IS A DOUBLE PRECISION ERASABLE LOCATION BY WHICH CONTROL IS TRANSFERRED AT THE END
R0120 OF EACH CYCLE OF AVERAGE G.
R0121 THE 2CADR OF A ROUTINE TO BE PERFORMED AT THAT TIME (E.G., STEERING EQUATIONS TO BE PERFORMED
R0123 AT 2 SECOND INTERVALS) MAY BE SET BY THE USER INTO AVGEXIT.
R0125 ALL SUCH ROUTINES SHOULD RETURN TO SERVEXIT, WHICH IS THE NORMAL EXIT FROM AVERAGE G.

R0127 SERVEXIT - DOES A PHASE CHANGE FOR RESTART PROTECTION AND GOES TO ENDOFJOB.
R0129 THE 2CADR OF SERVEXIT IS SET INTO AVGEXIT BY THE USER IF NO OTHER ROUTINE (SEE ABOVE).

R0131 AVGEND - LAST PASS OF AVERAGE G EXITS HERE, BYPASSING SPECIAL ROUTINE (SEE ABOVE UNDER READACCS).
R0133 FINAL EXIT IS TO CANV37. F AVERAGE G).

R0135 OUTPUT

R0136 CVTOTAL(2) PIPTIME(2) XPIPBUF(2) YPIPBUF(2) ZPIPBUF(2)
R0137 RN(6) REFERENCE COORD. SCALED AT 2(+29)M/CS
R0138 VN(6) REFERENCE COORD. SCALED AT 2(+7)M/CS
R0139 GDT/2(6) REFERENCE COORD. SCALED AT 2(+7)M/CS
R0140 DELV(6) STABLE MEMB. COORD.SCALED AT 2(+14)*5.85*10(-4)M/CS (KPIP1 USED TO GET DV/2 AT 2(+7))

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R0142     DELVREF(6)   REFERENCE COORD.   SCALED AT 2(+7)M/CS

R0143  INITIALIZATION

R0144          DMMONITOR FLAG SET BY ENTRY TO SHOW PIPBUF VALUES REQUIRED.
R0145          IDLE FLAG ON IF DVMON TO BE BYPASSED.
R0146          DVTHRUSH SET TO APPROPRIATE VALUE FOR DVMON.
R0147          AVGEXIT SET TO 2CADR OF ROUTINE, IF ANY, TO BE PERFORMED AFTER EACH CYCLE OF AVERAGE G.  IF NO ROUTINE
R0149                TO BE DONE, AVGEXIT SET TO SERVEXIT.
R0150          VALUES NEEDED
R0151                REFSMMAT
R0152                UNITW - FULL UNIT VECTOR, IN REFERENCE COORD., OF EARTH S ROTATIONAL VECTOR
R0154                RN1, VN1, PIPTIME1 - IN REFERENCE COORD., CONSISTENT WITH TIME OF EXECUTION OF PREREAD


R0156  DEBRIS

R0157     CENTRALS     A, L, Q
R0158     OTHER        INTERNAL - DVCNTR(1)  PIPAGE(1)  PIPCTR(1)  AVGEXIT(2)
R0159                  EXTERNAL - ITEMP1(1)  ITEMP2(1)  RUPTREG1(1)  TEMX(1)  TEMY(1)  TEMZ(1)
R0161                  USEFUL DEBRIS
R0162                     RN1(6)  VN1(6)  GDT1/2  PIPTIME1(2)
R0163                          THESE LOCATIONS USED AS BUFFER STORAGE FOR NEWLY CALCULATED VALUES OF RN, VN, GDT/2,
R0165                          AND PIPTIME DURING PERFORMANCE OF SERVICER ROUTINES.
R0167                  UNITR - HALF UNIT VECTOR OF RN, REFERENCE COORD.
R0168                  RMAG SCALED AT 2(+58) IN 36D.
R0169                  RMAGSQ SCALED AT 2(+58) IN 34D.
R0170                  (RE/RMAG)SQ IN 32D.


 0171                        27,2633                    BANK   27
 0172  REF   1               37,2000                    SETLOC SERVICES
 0173                        37,2604                    BANK

 0174  REF  13  LAST  756    E7,1431                    EBANK= DVCNTR
R0175  ********************************************  PREREAD  ************************************************************
R0177

 0178  REF   1                                         COUNT  37/SERV

 0179  REF   3  LAST  534    37,2604  3 4113 0  PREREAD  CA     OCT31          5.31 PROTECTS REDO5.31 AS IMMEDIATE TASK
 0182  REF  72  LAST  734    37,2605  54 0C1 1          TS     L
 0183                        37,2606  4 0000 0          COM
 0184  REF   3  LAST  524    37,2607  52 763 1          DXCH   -PHASE5

 0185  REF   1               37,2610  3 4766 1          CAF    PRIO21
 0186  REF  26  LAST  749    37,2611  0 5027 1          TC     NOVAC
 0187  REF   6  LAST  297    E3,1460                    EBANK= NBDX
 0188  REF   1               37,2612   03636 1          2CADR  LASTBIAS       DO LAST GYRO COMPENSATION IN FREE FALL
 0188  REF   1               37,2613   14063 1
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0189   REF   2  LAST  525   37,2614  0 2631 1  REDO5.31 TC      PREREAD1

0190   REF   4  LAST  224   37,2615  3 7667 1           CAF     PRIO32
0191   REF  28  LAST  755   37,2616  0 5042 1           TC      FINDVAC        SET UP NORMLIZE JOB REQUIRED PRIOR TO
0192   REF  14  LAST  773   E7,1431                     EBANK=  DVCNTR         FIRST AVERAGE G PASS
0193   REF   3  LAST  528   37,2617   03145 1           2CADR   NORMLIZE
0193                        37,2620   76067 1
0194   REF   3  LAST  639   37,2621  3 4735 1           CAF     2SECS
0195   REF  36  LAST  755   37,2622  0 5140 1           TC      WAITLIST
0196   REF  19  LAST  755   E6,1661                     EBANK=  AOG
0197   REF   2  LAST  528   37,2623   02653 C           2CADR   READACCS
0197                        37,2624   76066 C
0198   REF  33  LAST  581   37,2625  4 4711 C           CS      TWO
0199   REF   7  LAST  651   37,2626  0 4114 1           TC      NEWPHASE
0200                        37,2627   00005 1           OCT     5

0201   REF  41  LAST  745   37,2630  1 5213 C           TCF     TASKOVER


0202                        37,2631  0 0006 1  PREREAD1 EXTEND
0203   REF  17  LAST  216   37,2632  22 070 C           QXCH    RUPTREG1

0204   REF   1              37,2633  0 3163 C           TC      PIPASR         CLEAR + READ PIPS LAST TIME IN FREE FALL

02042  REF  94  LAST  746   37,2634  3 4712 1           CAF     ONE            SET UP PIPAGE FOR REREADAC IN CASE A
02043  REF   2  LAST   76   37,2635  55*230 C           TS      PIPAGE               RESTART OCCURS BEFORE READACCS

0205   REF  19  LAST  685   37,2636  4 0075 1           CS      FLAGWRD1       SET AVEG FLAG
0206   REF  59  LAST  721   37,2637  7 4712 C           MASK    BIT1
0207   REF  20  LAST  774   37,2640  26 075 1           ADS     FLAGWRD1

0208   REF  16  LAST  674   37,2641  3 4672 C           CA      POSMAX
0209   REF  14  LAST  654   37,2642  7 0076 1           MASK    FLAGWRD2
0210   REF  15  LAST  774   37,2643  54 076 1           TS      FLAGWRD2       KNOCK DOWN DRIFT FLAG

0211   REF  17  LAST  685   37,2644  4 0103 1           CS      FLAGWRD7       SET V37 FLAG
0212   REF  36  LAST  697   37,2645  7 4705 C           MASK    BIT6
0213   REF  18  LAST  774   37,2646  26 103 1           ADS     FLAGWRD7

0218   REF 147  LAST  733   37,2647  3 4714 1           CAF     ZERO
0224   REF   5  LAST  638   37,2650  55*425 1           TS      DVTOTAL        CLEAR DVTOTAL
0225   REF   6  LAST  774   37,2651  55*426 1           TS      DVTOTAL +1

0226   REF  18  LAST  774   37,2652  0 0070 C           TC      RUPTREG1
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P0227  ************************************  READACCS  ************************************************************
 0229  REF  20  LAST  774   E6,1661                          EBANK=  AOG
 0242  REF   2  LAST  774   37,2653  0 3163 C  READACCS  TC      PIPASR

 0243  REF  16  LAST  721   37,2654  3 4715 C  PIPSDONE  CAF     FIVE
 0244  REF  73  LAST  773   37,2655  54 001 1            TS      L
 0245                       37,2656  4 0000 0            COM
 0246  REF   4  LAST  773   37,2657  52 763 1            DXCH    -PHASE5

 0247  REF  95  LAST  774   37,2660  3 4712 1  READ5.5   CAF     ONE         SHOW PIPS HAVE BEEN READ
 0248  REF   3  LAST  774   37,2661  55'230 0            TS      PIPAGE

 0249  REF  34  LAST  774   37,2662  3 4711 1            CA      TWO         SET PIPCTR FOR CNMINTGR
 0250  REF   2  LAST   76   37,2663  55'227 C            TS      PIPCTR      AFTER ABOVE PHASCHNG

 0251  REF   3  LAST  751   37,2664  4 0102 C            CS      CM/FLAGS
 0252  REF  33  LAST  692   37,2665  7 4711 C            MASK    BIT2        CM/DSTBY
 0253  REF 178  LAST  734   37,2666  10 000 C            CCS     A
 0254  REF   2  LAST  211   37,2667  0 2742 1            TC      CHEKAVEG

 0255  REF   6  LAST  639   37,2670  4 1246 1            CS      PIPTIME1 +1
 0256  REF   2  LAST  656   37,2671  55'065 1            TS      TBASE6      FOR RESTARTS
 0260                       37,2672  0 0006 1            EXTEND              CONTINUE FOR ENTRY DAP
 0261  REF  21  LAST  775   37,2673  3 1662 1            DCA     AOG
 0262  REF   2  LAST  108   37,2674  53'670 C            DXCH    AOG/PIP
 0263  REF   2  LAST  108   37,2675  3 1663 C            CA      AMG
 0264  REF   2  LAST  108   37,2676  57'671 C            XCH     AMG/PIP
 0265                       37,2677  0 0006 1            EXTEND
 0266  REF   2  LAST  108   37,2700  3 1665 0            DCA     ROLL/180
 0267  REF   2  LAST  108   37,2701  53'673 C            DXCH    ROLL/PIP
 0268  REF   2  LAST  108   37,2702  3 1666 C            CA      BETA/180
 0269  REF   2  LAST  108   37,2703  57'674 C            XCH     BETA/PIP
 0270  REF   4  LAST  775   37,2704  3 0102 1            CA      CM/FLAGS
 0271  REF  26  LAST  659   37,2705  7 4677 1            MASK    BIT12       CM/DAPARM  930  BIT12
 0272                       37,2706  0 0006 1            EXTEND              DURING ENTRY, WHEN RCS DAP IS INACTIVE,
 0273  REF   1              37,2707  1 2725 1            BZF     NOSAVPIP    SAVE PIPAS EACH 0.5 SEC FOR TM.

 0274  REF   1              37,2710  3 2775 C            CA      0.5SEC
 0275  REF  37  LAST  774   37,2711  0 5140 1            TC      WAITLIST
 0276  REF   2  LAST  113   E6,1533                       EBANK=  XPIPBUF
 0277  REF   1              37,2712   02776 C            2CADR   QUIKREAD
 0277  REF   1              37,2713   76066 C
A0278                                                                    NO NEED TO RESTART PROTECT THIS.
 0279  REF   9  LAST  429   37,2714  3 1162 C            CA      DELVX       SAVE PIPAS AS READ (BUT NOT COMPENSATED)
 0280  REF   3  LAST  775   37,2715  57'533 C            XCH     XPIPBUF
 0281  REF   2  LAST  113   37,2716  55'536 1            TS      XOLDBUF

 0282  REF   5  LAST  428   37,2717  3 1164 C            CA      DELVY
 0283  REF   2  LAST  113   37,2720  57'534 1            XCH     YPIPBUF
 0284  REF   2  LAST  113   37,2721  55'537 C            TS      YOLDBUF
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0285   REF   4  LAST  428   37,2722  3 1166 1          CA     DELVZ
0286   REF   2  LAST  113   37,2723  57'535 C          XCH    ZPIPBUF
0287   REF   1              37,2724  55'540 C          TS     ZOLDBUF

0288   REF  17  LAST  775   37,2725  3 4715 C  NOSAVPIP CA     FIVE
0289   REF   4  LAST  212   37,2726  55'725 1          TS     CM/GYMDT

0290   REF   1              37,2727  3 3142 C          CA     JTAGTIME      ACTIVATE CM/RCS AFTER PIPUP TO GO
A0291                                                                     IN JTAGTIME +5 CS.
0292   REF  38  LAST  775   37,2730  0 5140 1          TC     WAITLIST
0293   REF  22  LAST  775   E6,1661                    EBANK= ACG
0294   REF   2  LAST  205   37,2731   03222 C          2CADR  SETJTAG
0294                        37,2732   32066 C

0295   REF  26  LAST  751   37,2733  4 6214 1          CS     THREE         1.3SPOT FOR SETJTAG
0296   REF   8  LAST  774   37,2734  0 4114 1          TC     NEWPHASE
0297                        37,2735   00001 C          OCT    1

0298   REF   4  LAST  643   37,2736  3 4362 1          CAF    OCT37
0299   REF  74  LAST  775   37,2737  54 001 1          TS     L
0300                        37,2740  4 0000 C          COM
0301   REF   5  LAST  775   37,2741  52 763 1          DXCH   -PHASE5

0302   REF  21  LAST  774   37,2742  4 0075 1  CHEKAVEG CS     FLAGWRD1
0303   REF  6C  LAST  774   37,2743  7 4712 C          MASK   BIT1
0304   REF 179  LAST  775   37,2744  10 000 C          CCS    A             IF AVEG FLAG DOWN SET FINAL EXIT AVEG
0305   REF   1              37,2745  0 2765 1          TC     AVEGCUT

0306   REF   4  LAST  774   37,2746  3 4735 1          CAF    2SECS
0307   REF  39  LAST  776   37,2747  0 5140 1          TC     WAITLIST
0308   REF  23  LAST  776   E6,1661                    EBANK= ACG
0309   REF   3  LAST  774   37,2750   02653 C          2CADR  READACCS
0309                        37,2751   76066 C

0310   REF   7  LAST  662   37,2752  3 4675 1  MAKESERV CAF    PRIO20        ESTABLISH SERVICER ROUTINE
0311   REF  29  LAST  774   37,2753  0 5042 1          TC     FINDVAC
0312   REF  15  LAST  774   E7,1431                    EBANK= OVCNTR
0313   REF   2  LAST  210   37,2754   03013 C          2CADR  SERVICER
0313                        37,2755   76067 1

0314   REF   8  LAST  427   37,2756  4 4710 1          CS     FOUR          RESTART SERVICER AND READACCS
0315   REF   9  LAST  776   37,2757  0 4114 1          TC     NEWPHASE
0316                        37,2760   00005 1          OCT    5

0317   REF  27  LAST  718   37,2761  3 4702 C          CAF    BIT9
0318                        37,2762  0 0006 1          EXTEND
0319   REF  25  LAST  654   37,2763  05 011 1          WOR    DSALMOUT      TURN TEST CONNECTOR OUTBIT ON

0320   REF  42  LAST  774   37,2764  1 5213 C          TCF    TASKOVER      END PREVIOUS READACCS WAITLIST TASK
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0321                              37,2765  0 0006 1  AVEGOUT  EXTEND
0322   REF   1                    37,2766  3 2772 1           DCA     AVOUTCAD
0323   REF   2  LAST  527         37,2767  53'223 1           DXCH    AVGEXIT
0324   REF   1                    37,2770  1 2752 1           TCF     MAKESERV

0325   REF  16  LAST  776         E7,1431                     EBANK=  DVCNTR
0326   REF   1                    37,2771    03074 1  AVOUTCAD 2CADR   AVGEND
0326   REF   1                    37,2772    76067 1
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R0327   ROUTINE NAME: CNMNITOR
R0328   MCC 04 BY BAIRNSFATHER  30 APR 1968                REDO CNMNITOR TO SAVE PIPS EACH 0.5 SEC FOR TM,ENTRY.
R0330   MCC 03 BY FISHER DECEMBER 1967
R0331   MCC 02 BY RYE SEPT 1967
R0332   MCC 01 BY KOSMALA 23 MAR 1967
R0333   MCC 00 BY KOSMALA 27 FEB 1967

R0334   FUNCTIONAL DESCRIPTION

R0335           THE PURPOSE OF CNMONITOR IS TO PROVIDE 1/2 SEC.READING OF PIPAS FOR DOWNLIST DURING ENTRY.
R0337           X,Y,ZPIPBUF CONTAIN PRESENT VALUES X,Y,ZOLDBUF CONTAIN VALUES FROM PREVIOUS READING.

R0339   CALLING SEQUENCE

R0340           CALL AS WAITLIST TASK. TERMINATES ITSELF IN TASKOVER

R0341   INITIALISATION

R0342           PIPCTR = 2 (FOR DT = 0.5 SEC)
R0343           X,Y,ZPIPBUF SET TO PREVIOUS PIPAX,Y,Z

R0344   OUTPUT

R0345           X,Y,ZPIPBUF, X,Y,ZOLDBUF
R0346   DEBRIS

R0347           X,Y,ZPIPBUF CONTAIN LAST PIPAX,Y,Z VALUES
R0348                   X,Y,ZOLDBUF CONTAIN LAST-BUT-ONE PIPAX,Y,Z VALUES
R0349           RUPTREG1
R0350           PIPCTR

 0351   REF    3  LAST  775   37,2773  55'227 C  ONMNITOR TS      PIPCTR

 0352   REF   12  LAST  684   37,2774  0 5156 C          TC      FIXDELAY        WAIT
 0353                         37,2775   00062 C  0.5SEC   DEC     50

 0354   REF   35  LAST  775   37,2776  3 4711 1  QUIKREAD CAF     TWO
 0355   REF   19  LAST  774   37,2777  54 070 1          TS      RUPTREG1
 0356   REF  180  LAST  776   37,3000  50 000 1          INDEX   A
 0357   REF    9  LAST  428   37,3001  3 0037 C          CA      PIPAX           SAVE ACTUAL PIPAS FOR TM.
 0358   REF   20  LAST  778   37,3002  50 070 C          INDEX   RUPTREG1
 0359   REF    4  LAST  775   37,3003  57'533 C          XCH     XPIPBUF         UPDATE X,Y,ZPIPBUF
 0360   REF   21  LAST  778   37,3004  50 070 C          INDEX   RUPTREG1
 0361   REF    3  LAST  775   37,3005  55'536 1          TS      XOLDBUF         AND X,Y,ZOLDBUF
 0362   REF   22  LAST  778   37,3006  10 070 1  CHKCTR   CCS     RUPTREG1
 0363   REF    2  LAST  775   37,3007  1 2777 C          TCF     QUIKREAD +1     LOOP AGAIN
 0364   REF    4  LAST  778   37,3010  11'227 C          CCS     PIPCTR
 0365   REF    1               37,3011  1 2773 1          TCF     ONMNITOR
 0366   REF   43  LAST  776   37,3012  0 5213 1          TC      TASKOVER
```

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P0367  ************************************  SERVICER  ************************************************************
R0369

 0370   REF  17  LAST  777   E7,1431                          EBANK= DVCNTR

 0371   REF  36  LAST  778   37,3013  3 4711 1  SERVICER CAF    TWO
 0372                        37,3014  0 0004 0           INHINT
 0373   REF  23  LAST  778   37,3015  54 070 1  PIPCHECK TS     RUPTREG1

 0374                        37,3016  6 0000 1           DOUBLE
 0375   REF 181  LAST  778   37,3017  50 000 1           INDEX  A
 0376   REF  10  LAST  775   37,3020  11'162 1           CCS    DELVX
 0377                        37,3021  0 3023 0           TC     +2
 0378   REF   1              37,3022  0 3031 0           TC     PIPLOOP

 0379   REF   1              37,3023  6 3141 0           AD     -MAXDELV      DO PIPA-SATURATION TEST BEFORE
 0380                        37,3024  0 0006 1           EXTEND
 0381   REF   2  LAST  779   37,3025  6 3031 0           BZMF   PIPLOOP       COMPENSATION.

 0382   REF  32  LAST  756   37,3026  0 5537 0           TC     ALARM
 0383                        37,3027   00205 0           OCT    00205         SATURATED-PIPA ALARM  ***CHANGE LATER
 0384   REF   1              37,3030  0 3052 0           TC     AVERAGEG

 0385   REF  24  LAST  779   37,3031  10 070 1  PIPLOOP  CCS    RUPTREG1
 0386   REF   1              37,3032  1 3015 1           TCF    PIPCHECK

 0387   REF  81  LAST  755   37,3033  0 5301 0           TC     PHASCHNG      RESTART REREADAC + SERVICER
 0388                        37,3034   16035 0           OCT    16035
 0389                        37,3035   20000 0           OCT    20000
 0390   REF  18  LAST  779   E7,1431                          EBANK= DVCNTR
 0391   REF   1              37,3036   03042 1           2CADR  DVTOTUP
 0391   REF   1              37,3037   76067 1

 0392   REF 232  LAST  756   37,3040  0 4555 0           TC     BANKCALL      PIPA COMPENSATION CALL
 0393   REF   2  LAST  429   37,3041   15262 0           CADR   1/PIPA

 0394   REF 201  LAST  755   37,3042  0 6006 1  DVTOTUP  TC     INTPRET
 0395                        37,3043   51575 1           VLOAD  ABVAL         GET ABS VALUE OF DELV
 0396   REF   8  LAST  173   37,3044   01163 1                  DELV
 0397                        37,3045   77405 0           DMP    EXIT
 0398   REF   1              37,3046   37356 0                  KPIP1         SCALE AT 2(+7)

 0399                        37,3047  0 0006 1           EXTEND
 0400   REF 279  LAST  761   37,3050  3 0155 0           DCA    MPAC
 0401   REF   7  LAST  774   37,3051  21'426 1           DAS    DVTOTAL       ACCUMULATE DVTOTAL
 0402   REF  82  LAST  779   37,3052  0 5301 0  AVERAGEG TC     PHASCHNG
 0403                        37,3053   10035 0           OCT    10035

 0404   REF 202  LAST  779   37,3054  0 6006 1           TC     INTPRET
 0405                        37,3055   77624 1           CALL
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0406   REF   1                 37,3056   77325 C                CALCRVG
0407                           37,3057   77776 1          EXIT

0408   REF  83  LAST  779      37,3060   0 5301 C         TC     PHASCHNG
0409                           37,3061    10035 0         OCT    10035

0410   REF   4  LAST  773      37,3062   3 4113 C         CAF    OCT31        COPY RN1,VN1,GOT102,GOBL1/2,PIPTIME1
0411   REF  11  LAST  645      37,3063   0 5475 1         TC     GENTRAN      INTO RN ,VN ,GOT/12 ,GOBL/2 ,PIPTIME
0412   REF   6  LAST  526      37,3064    01231 C         ADRES  RN1
0413   REF  14  LAST  755      37,3065    01170 C         ADRES  RN
04131                          37,3066   0 0003 1         RELINT                GENTRAN DOES AN INHINT
0414   REF  84  LAST  780      37,3067   0 5301 C         TC     PHASCHNG
0415                           37,3070    10035 0         OCT    10035

0416                           37,3071   0 0006 1         EXTEND
0417   REF   3  LAST  777      37,3072   3 1223 C         DCA    AVGEXIT
0418   REF  15  LAST  472      37,3073   52 006 C         DXCH   Z             AVERAGEG EXIT

0419   REF  12  LAST  753      37,3074   3 1205 1  AVGEND CA     PIPTIME +1    FINAL AVERAGE G EXIT
0420   REF   1                 37,3075   55*074 1         TS     OLDBT1        SET UP FREE FALL GYRO COMPENSATION

0421   REF  47  LAST  751      37,3076   0 5435 C         TC     UPFLAG        SET DRIFTFLG
0422   REF   3  LAST  719      37,3077    00036 1         ADRES  DRIFTFLG      BIT 15  FLAG 2
0425   REF  26  LAST  755      37,3100   0 5261 1         TC     2PHSCHNG
0426                           37,3101    00005 1         OCT    5             GROUP 5 OFF
0427                           37,3102    05022 1         OCT    05022         GROUP 2 ON FOR AVETOMID
0428                           37,3103    20000 C         OCT    20000

0429   REF 203  LAST  779      37,3104   0 6006 1         TC     INTPRET
0430                           37,3105    77624 1         CALL
0431   REF   1                 37,3106    27472 C                AVETOMID      CONVERT STATE VECTOR TO REFERENCE SCALE.
0432                           37,3107    77776 1         EXIT

0432C1 REF 148  LAST  774      37,3110   3 4714 1         CAF    ZERO          ZERO MARK COUNTERS.
0432C2 REF   9  LAST  572      37,3111   55*125 1         TS     VHFCNT
0432C3 REF   6  LAST  572      37,3112   55*126 1         TS     TRKMKCNT

04321  REF 233  LAST  779      37,3113   0 4555 C         TC     BANKCALL
04322  REF   1                 37,3114    17112 C         CADR   PIPFREE

04323  REF  28  LAST  776      37,3115   4 4702 1         CS     BIT9
043235 REF  17  LAST  573      37,3116   55*734 1         TS     MRKBUF2       INVALIDATE MARK BUFFER
04324                          37,3117   0 0006 1         EXTEND
04325  REF  26  LAST  776      37,3120   03 011 1         WAND   DSALMOUT

043255 REF  50  LAST  749      37,3121   0 5447 0         TC     DOWNFLAG
043256 REF   1                 37,3122    00147 C         ADRES  CM/DSTBY

04326  REF  51  LAST  780      37,3123   0 5447 0         TC     DOWNFLAG
04327  REF   2  LAST  497      37,3124    00162 1         ADRES  V37FLAG
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0433  REF  40  LAST  697   37,3125  3 4704 C          CAF     BIT7          RESTORE GROUP 1 + 2 IF P20 IS RUNNING.
0434  REF  10  LAST  252   37,3126  7 0074 C          MASK    FLAGWRDO
0435                       37,3127  0 0006 1          EXTEND
0436                       37,3130  1 3134 C          BZF     +4

0437  REF  27  LAST  78C   37,3131  0 5261 1          TC      2PHSCHNG
0438                       37,3132   00111 0          OCT     111           1.11SPOT
0439                       37,3133   00132 1          OCT     132           2.13SPOT

0445  REF  46  LAST  755   37,3134  0 4574 C          TC      POSTJUMP
0446  REF   2  LAST  194   37,3135   10123 C          CADR    CANV37

0447  REF  85  LAST  78C   37,3136  0 5301 0 SERVEXIT TC      PHASCHNG
0448                       37,3137   00035 1          OCT     00035         A, 5.3 = REREADAC  (ONLY)

0449  REF  98  LAST  755   37,3140  1 5112 1          TCF     ENDOFJOB

0450  REF   4  LAST  377      4717          DVTHRUSH EQUALS ELEVEN          15 PERCENT OF 2SEC PIPA ACCUMULATION,
A0451                                                                          FOR 503-FULL CSM/LEM....DELV SC.AT
A0452                                                                          5.85 CM/SEC.

0453                       37,3141   63401 1 -MAXDELV DEC     -6398         3200 PPS FOR 2 SEC  CCS TAKES 1

0454                       37,3142   00170 1 JTAGTIME DEC     120           = 1 SEC + T CDU, T CDU = .1 SEC

0455                       37,3143   00372 1 2.5SEC   DEC     250
0456                       37,3144   00044 1 MDOTFAIL DEC     144.0 B-16    5 SEC MASS LOSS AT 28.8 KG/SEC
A0457                                                                        SHOULD BE 2-4 SECS FOR NO START
A0458                                                                                  6-8 SECS FOR FAILURE
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P0459      NORMLIZE PERFORMS THE INITIALIZATION REQUIRED PRIOR TO THE FIRST ENTRY TO AVERAGEG, AND SCALES RN SO THAT IT
R0461   HAS 1 LEADING BINARY ZERO. IN MOST MISSIONS, RN WILL BE SCALED AT 2(+29), BUT IN THE 206 MISSION, RN WILL BE
R0463   SCALED AT 2(+24)M.

 0464   REF   1                  37,3145  3 4720 C  NORMLIZE CAF     THIRTEEN        SET UP TO COPY 14 REGS- RN1,VN1,PIPTIME1
 0465   REF  12  LAST  78C       37,3146  0 5475 1           TC      GENTRAN         INTO RN,VN, PIPTIME
 0466   REF   7  LAST  78C       37,3147   01231 C           ADRES   RN1             FROM HERE
 0467   REF  15  LAST  78C       37,3150   01170 C           ADRES   RN              TO HERE

 0468                             37,3151  0 0003 1           RELINT
 0469   REF 204  LAST  78C       37,3152  0 6006 1           TC      INTPRET
 0470                             37,3153   45175 C           VLOAD   CALL            LOAD RN FOR CALCGRAV
 0471   REF  16  LAST  782       37,3154   01171 1                   RN
 0472   REF   3  LAST  666       37,3155   77260 C                   CALCGRAV        INITIALISE UNITR RMAG GDT1

 0473   REF   3  LAST  677       37,3156   25207 C           STOVL   GDT/2
 0474   REF   2  LAST   77       37,3157   01256 1                   GOBL1/2
 0475   REF   3  LAST  677       37,3160   01215 C           STORE   GOBL/2
 0476                             37,3161   77776 1           EXIT
 0477   REF  99  LAST  781       37,3162  1 5112 1           TCF     ENDOFJOB
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P0478   *****  PIPA READER *****

R0479                   MOD NO. 00  BY D. LICKLY  DEC.9 1966

R0480   FUNCTIONAL DESCRIPTION

R0481       SUBROUTINE TO READ PIPA COUNTERS, TRYING TO BE VERY CAREFUL SO THAT IT WILL BE RESTARTABLE.
R0483       PIPA READINGS ARE STORED IN THE VECTOR DELV. THE HIGH ORDER PART OF EACH COMPONENT CONTAINS THE PIPA READING,
R0485       RESTARTS BEGIN AT REREADAC.


R0486       AT THE END OF THE PIPA READER THE CDUS ARE READ AND STORED AS A
R0487   VECTOR IN CDUTEMP.  THE HIGH ORDER PART OF EACH COMPONENT CONTAINS
R0488   THE CDU READING IN 2S COMP IN THE ORDER CDUX,Y,Z.  THE THRUST
R0489   VECTOR ESTIMATOR IN FINDCDUD REQUIRES THE CDUS BE READ AT PIPTIME.

R0490   CALLING SEQUENCE AND EXIT

R0491       CALL VIA TC, ISWCALL, ETC.

R0492       EXIT IS VIA Q.

R0493   INPUT

R0494       INPUT IS THROUGH THE COUNTERS PIPAX, PIPAY, PIPAZ, AND TIME2.

R0495   OUTPUT

R0496       HIGH ORDER COMPONENTS OF THE VECTOR DELV CONTAIN THE PIPA READINGS.
R0497       PIPTIME CONTAINS TIME OF PIPA READING.

R0498   DEBRIS (ERASABLE LOCATIONS DESTROYED BY PROGRAM)

R0499               LOW ORDER DELV'S ARE ZEROED FOR TM INDICATION.
R0500               TEMX    TEMY    TEMZ    PIPAGE


 0501                                       37,3163  0 0006 1  PIPASR   EXTEND
 0502   REF   26  LAST  733                 37,3164  3 0025 0           DCA     TIME2
 0503   REF    7  LAST  775                 37,3165  53'246 1           DXCH    PIPTIME1        CURRENT TIME  POSITIVE VALUE
 0504   REF  149  LAST  780                 37,3166  4 4714 0           CS      ZERO            INITIALIZE THESE AT NEG ZERO.
 0505   REF    2  LAST   76                 37,3167  55'224 0           TS      TEMX
 0506   REF    2  LAST   76                 37,3170  55'225 1           TS      TEMY
 0507   REF    2  LAST   76                 37,3171  55'226 1           TS      TEMZ
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0508   REF 150  LAST 783   37,3172  3 4714 1          CA     ZERO
0509   REF   5  LAST 776   37,3173  55'166 C          TS     DELVZ      OTHER DELVS OK INCLUDING LOW ORDER
0510   REF   6  LAST 775   37,3174  55'164 1          TS     DELVY

0511   REF  11  LAST 779   37,3175  55'163 C          TS     DELVX +1   LOW ORDER DELV'S ARE ZEROED FOR TM: THUS
0512   REF   7  LAST 784   37,3176  55'165 C          TS     DELVY +1   IF DNLNK'D LOW ORDER DELVS ARE NZ, THEY
0513   REF   6  LAST 784   37,3177  55'167 1          TS     DELVZ +1   CONTAIN PROPER COMPENSATION. IF=0, THEN
A0514                                                                  THE TM VALUES ARE BEFORE COMPENSATION.

0515   REF   4  LAST 775   37,3200  55'230 C          TS     PIPAGE     SHOW PIPA READING IN PROGRESS

0516                       37,3201  0 0006 1  REPIP1  EXTEND
0517   REF  10  LAST 778   37,3202  4 0040 1          DCS    PIPAX      X AND Y PIPS READ
0518   REF   3  LAST 783   37,3203  53'225 1          DXCH   TEMX
0519   REF  11  LAST 784   37,3204  52 040 1          DXCH   PIPAX      PIPAS SET TO NEG ZERO AS READ.
0520   REF  12  LAST 784   37,3205  55'162 1          TS     DELVX
0521   REF   8  LAST 784   37,3206  23'164 C          LXCH   DELVY

0522   REF   4  LAST 428   37,3207  4 0041 C  REPIP3  CS     PIPAZ      REPEAT PROCESS FOR Z PIP
0523   REF   3  LAST 783   37,3210  57'226 C          XCH    TEMZ
0524   REF   5  LAST 784   37,3211  56 041 1          XCH    PIPAZ
0525   REF   7  LAST 784   37,3212  55'166 C  DODELVZ  TS     DELVZ

0526   REF 170  LAST 689   37,3213  0 0002 C          TC     Q

0527   REF  24  LAST 776   E6,1661                    EBANK= A0G

0528   REF   3  LAST 646   37,3214  10 763 1  REREADAC CCS    PHASE5     LAST PASS CHECK
0529                       37,3215  1 3217 1          TCF    +2
0530   REF  44  LAST 778   37,3216  1 5213 C          TCF    TASKOVER

0531   REF   5  LAST 784   37,3217  11'230 C          CCS    PIPAGE
0532   REF   4  LAST 776   37,3220  1 2653 1          TCF    READACCS   PIP READING NOT STARTED. GO TO BEGINNING

0533   REF   1             37,3221  3 3257 1          CAF    DONEADR    SET UP RETURN FROM PIPASR
0534   REF 171  LAST 784   37,3222  54 002 1          TS     Q

0535   REF   8  LAST 784   37,3223  11'166 C          CCS    DELVZ
0536   REF 172  LAST 784   37,3224  0 0002 C          TC     Q          Z DONE, GO DO CDUS
0537                       37,3225  1 3230 1          TCF    +3         Z NOT DONE, CHECK Y.
0538   REF 173  LAST 784   37,3226  0 0002 C          TC     Q
0539   REF 174  LAST 784   37,3227  0 0002 C          TC     Q
0540                       37,3230  22 007 C          ZL
0541   REF   9  LAST 784   37,3231  11'164 1          CCS    DELVY
0542                       37,3232  1 3235 1          TCF    +3
0543   REF   1             37,3233  1 3244 1          TCF    CHKTEMX    Y NOT DONE, CHECK X.
0544                       37,3234  1 3235 1          TCF    +1
0545   REF   6  LAST 784   37,3235  22 041 1          LXCH   PIPAZ      Y DONE, ZERO Z PIP.
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0546   REF    4  LAST  784   37,3236  11'226 1            CCS    TEMZ
0547   REF    5  LAST  785   37,3237  4 1226 1            CS     TEMZ        TEMZ NOT = -0, CONTAINS -PIPAZ VALUE.
0548   REF    1             37,3240  1 3212 1            TCF    DODELVZ
0549                        37,3241  1 3237 0            TCF    -2
0550   REF    9  LAST  784   37,3242  23'166 1            LXCH   DELVZ       TEMZ = -0, L HAS ZPIP VALUE.
0551   REF  175  LAST  784   37,3243  0 0002 0            TC     Q

0552   REF    4  LAST  784   37,3244  11'224 0  CHKTEMX    CCS    TEMX        HAS THIS CHANGED
0553   REF    5  LAST  785   37,3245  4 1224 0            CS     TEMX        YES
0554                        37,3246  1 3251 0            TCF    +3          YES
0555                        37,3247  1 3245 0            TCF    -2          YES
0556   REF    1             37,3250  1 3201 0            TCF    REPIP1      NO
0557   REF   13  LAST  784   37,3251  55'162 1            TS     DELVX

0558   REF    3  LAST  783   37,3252  4 1225 1            CS     TEMY
0559   REF   10  LAST  784   37,3253  55'164 1            TS     DELVY

0560   REF  151  LAST  784   37,3254  4 4714 0            CS     ZERO        ZERO X AND Y PIPS
0561   REF   12  LAST  784   37,3255  52 040 1            DXCH   PIPAX       L STILL ZERO FROM ABOVE

0562   REF    1             37,3256  1 3207 0            TCF    REPIP3

0563   REF    1             37,3257   02654 1  DONEADR   GENADR PIPSDONE
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R0564   ********************************************************************************************************

R0566           ROUTINE CALCRVG INTEGRATES THE EQUATIONS OF MOTION BY AVERAGING THE THRUST AND GRAVITATIONAL
R0568   ACCELERATIONS OVER A TIME INTERVAL OF 2 SECONDS.

R0569           FOR THE EARTH-CENTERED GRAVITATIONAL FIELD, THE PERTURBATION DUE TO OBLATENESS IS COMPUTED TO THE FIRST
R0571   HARMONIC COEFFICIENT J.

R0572           ROUTINE CALCRVG REQUIRES...
R0573                 1) THRUST ACCELERATION INCREMENTS IN DELV SCALED SAME AS PIPAX,Y,Z IN STABLE MEMBER COORDS.
R0575                 2) VN SCALED 2(+7)M/CS IN REFERENCE COORDS.
R0576                 3) RN SCALED AT 2(+29) METERS IN REFERENCE COORDS.
R0577                 4) UNITW THE EARTH S UNIT ROTATIONAL VECTOR (SCALED AS A FULL UNIT VECTOR) IN REFERENCE COORDS.

R0579   IT LEAVES RN1 UPDATED (SCALED AT 2(+29)M, VN1 (SCALED AT 2(+7)M/CS), AND GDT1/2 (SCALED AT 2(+7)M/CS). ALSO HALF
R0581   UNIT VECTOR UNITR, RMAG IN 36D SCALED AT 2(+29)M, R MAG SQ. IN 34D SCALED AT 2(+58) M SQ.
R0583

 0584                          37,3260  41456 C  CALCGRAV UNIT   PUSH          ENTER WITH RN IN MPAC
 0585   REF   1                37,3261  01760 1            STORE  UNITR
 0586                          37,3262  67340 1            LXC,1  SLOAD
 0587   REF  14  LAST  677     37,3263  03746 1                   RTX2
 05871  REF  34  LAST  738     37,3264  00047 1                   X1
 0588                          37,3265  77240 1            BMN    VLOAD
 05881  REF   1                37,3266  77314 1                   ITISMOON
 0589                          37,3267  41441 C            DOT    PUSH
 0590   REF   8  LAST  763     37,3270  01714 1                   UNITW
 0591                          37,3271  44316 C            DSQ    BDSU
 0592   REF   1                37,3272  37366 C                   DP1/2C
 0593                          37,3273  56325 C            PDDL   DDV
 0594   REF   1                37,3274  37370 1                   RESQ
 0595                          37,3275  00043 C                   34D           (RN)SQ
 0596                          37,3276  00041 1            STORE  32D           TEMP FOR (RE/RN)SQ
 0597                          37,3277  41205 C            DMP    DMP
 0598   REF   1                37,3300  37372 C                   20J
 0599                          37,3301  65361 C            VXSC   PDDL
 0600   REF   2  LAST  786     37,3302  01760 1                   UNITR
 0601                          37,3303  41205 C            DMP    DMP
 0602   REF   1                37,3304  37374 C                   2J
 0603                          37,3305  00041 1                   32D
 0604                          37,3306  53361 C            VXSC   VAD
 0605   REF   9  LAST  786     37,3307  01714 1                   UNITW
 0606                          37,3310  77626 C            STADR
 0607   REF   3  LAST  782     37,3311  76521 C            STORE  GOBL1/2
 0608                          37,3312  41455 C            VAD    PUSH
 0609   REF   3  LAST  786     37,3313  01760 1                   UNITR
 0610                          37,3314  60345 C  ITISMOON DLOAD  NORM
 0611                          37,3315  00043 C                   34D
 0612   REF  14  LAST  738     37,3316  00050 1                   X2
 06121                         37,3317  53663 1            BDDV*  SLR*
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06122  REF   1                37,3320  37360 C                -MUDT(E),1
0613                          37,3321  56623 C                0 -210,2
0614                          37,3322  45561 1          VXSC  STADR
0615   REF   2  LAST   76     37,3323  76527 C          STORE GDT1/2          SCALED AT 2(+7) M/CS
0616                          37,3324  77616 C          RVQ

0622                          37,3325  74375 C  CALCRVG VLOAD VXSC
0623   REF   9  LAST  779     37,3326  01163 1                DELV
0624   REF   2  LAST  779     37,3327  37356 C                KPIP1
0625                          37,3330  76505 C          VXM   VSL1
0626   REF  32  LAST  769     37,3331  01736 1                REFSMMAT
0627   REF   7  LAST  674     37,3332  03433 C          STORE DELVREF         DELV IN REF COORDS AT 2(+7)
0628                          37,3333  41562 C          VSR1  PUSH
0629                          37,3334  41455 C          VAD   PUSH            (DV-CLOGDT)/2 TO PD SCALED AT 2(+7)M/CS
0630   REF   4  LAST  782     37,3335  01207 0                GDT/2
0631                          37,3336  74255 C          VAD   VXSC
0632   REF  12  LAST  755     37,3337  01177 1                VN
0633   REF   1                37,3340  37364 1                2SEC(22)
0634                          37,3341  44055 1          VAD   STQ
0635   REF  17  LAST  782     37,3342  01171 1                RN
0636                          37,3343  00037 C                31D
0637   REF   8  LAST  782     37,3344  35232 1          STCALL RN1            TEMP STORAGE OF RN SCALED 2(+29)M
0638   REF   4  LAST  782     37,3345  77260 0                CALCGRAV
0639                          37,3346  53255 C          VAD   VAD
0640                          37,3347  77655 1          VAD
0641   REF  13  LAST  787     37,3350  01177 1                VN
0642   REF   3  LAST  527     37,3351  35240 1          STCALL VN1            TEMP STORAGE OF VN SCALED 2(+7)M/CS
0643                          37,3352  00037 C                31D

0644                          37,3353  03215 1  KPIP    2DEC   .1024          SCALES DELV TO 2(+4)
0644                          37,3354  27057 C
0645                          37,3355  02312 0  KPIP1   2DEC   0.074880      207 DELV SCALING. 1 PULSE = 5.85 CM/SEC.
0645                          37,3356  32537 1
0646                          37,3357  61377 C  -MUDT(E) 2DEC*  -7.9720645 E+12 B-44*
0646                          37,3360  55754 1
0647                          37,3361  77644 1  -MUDT(M) 2DEC*  -9.805556 E+10 B-44*
0647                          37,3362  65556 1
0648                          37,3363  00000 1  2SEC(22) 2DEC   200 B-22
0648                          37,3364  31000 C

0649                          37,3365  01463 1  DP1/20  2DEC   0.05
0649                          37,3366  06315 C
0650                          37,3367  00001 0  RESQ    2DEC*  40.6809913 E12 B-59*
0650                          37,3370  05000 1
0651                          37,3371  02047 C  20J     2DEC*  3.24692010 E-2 B1*
0651                          37,3372  36332 C
0652                          37,3373  00152 1  2J      2DEC*  3.24692010 E-3 B1*
0652                          37,3374  14511 1
```

L ENTRY LEXICON USER'S PAGE NO. 1 EO S3

	VARIABLE	DESCRIPTION	MAXIMUM VALUE *	COMPUTER NAME
R0001 R0003				
R0005	-			
R0006	LATO	INITIAL TARGET VECTOR	2 (UNIT VECTOR)	= RTINIT
R0008	-			
R0009	U2	UNIT VECTOR NORTH	1	= UNITW
R0011	-			
R0012	V	VELOCITY VECTOR	2 VSAT	= VEL
R0014	-			
R0015	R	POSITION VECTOR	2 EXP 29 METERS	= RN
R0017	-			
R0018	VI	INERTIAL VELOCITY	128 M/CENTISEC	= VN
R0020	-			
R0021	RTE	VECTOR EAST AT INITIAL TARGET	2	= RTEAST
R0023	-			
R0024	UTR	NORMAL TO RTE AND UZ	2	= RTNORM
R0026	-			
R0027	URT	TARGET VECTOR	2	= RT
R0029	-			
R0030	UNI	UNIT NORMAL TO TRAJECTORY PLANE	2	
R0031	-			
R0032	DELV	INTEGRATED ACCEL. FROM PIPAS	5.85 16384 CM/S	
R0033	-			
R0034	G	GRAVITY VECTOR	128 M/CENTISEC	= GDT/2
R0036	AC	INITIAL DRAG FOR UPCONTRL	805 FPSS	FPSS=FT/SEC/SEC
R0038	AHOOKDV	TERM IN GAMMAL CALC. = AHOOK DVL	8	
R0039	A1	DRAG VALUE IN FACTOR CALCULATION	805 FPSS	
R0040	ALP	CONST FOR UPCONTRL	1	
R0041	ASKEP	KEPLER RANGE	21600 NM	NM = NAUTICAL MILE
R0043	ASP1	FINAL PHASE RANGE	21600 NM	
R0044	ASPUP	UP-RANGE	21600 NM	
R0045	ASP3	GAMMA CORRECTION	21600 NM	
R0046	ASPDWN	RANGE DOWN TO PULL-UP	21600 NM	
R0047	ASP	PREDICTED RANGE	21600 NM	NOT STORED
R0049	CCSG	COSINE(GAMMAL)	2	= COSG/2
R0051	C/DO	RECIPROCAL DRAG, -4/DO B-8	64/FPSS	
R0052	D	TOTAL ACCELERATION	805 FPSS	
R0053	DC	CONTROLLED CONSTANT D	805 FPSS	
R0054	DHOOK	TERM IN GAMMAL COMPUTATION	805 FPSS	
R0055	DIFF	THETAM-ASP (RANGE DIFFERENCE)	21600 NM	
R0056	DIFFOLD	PREVIOUS VALUE OF DIFF	21600 NM	
R0057	DLEWD	CHANGE IN LEWD	1	
R0058	DR	REFERENCE DRAG FOR DOWNCONTROL	805 FPSS	NOT STORED
R0060	DREFR	REFERENCE DRAG	805 FPSS	NOT STORED
R0062	DVL	VS1-VL	2 VSAT	
R0063	E	ECCENTRICITY	4	NOT STORED
R0065	F1	DRANGE/D DRAG (FINAL PHASE)	2700/805	= FX +5
R0067	F2	DRANGE/D ROOT (FINAL PHASE)	2700/2VS NM/FPS	= FX +4

L ENTRY LEXICON USER'S PAGE NO. 2 E0 S3

R0069	F3	DRANGE/D (L/D)	2700 NM	= FX
R0071	FACT1	CONST FOR UPCONTRL	805 FPSS	
R0072	FACT2	CONST FOR UPCONTRL	1/805 FPSS	
R0073	FACTOR	USED IN UPCONTRL	1	* MAXIMUM VALUE DENOTES UNSCALED
R0075	GAMMAL	FLIGHT PATH ANGLE AT VL	1 RADIAN	VARIABLE VALUE WHEN SCALED
R0077	GAMMAL1	SIMPLE FORM OF GAMMAL	1 RADIAN	VARIABLE HAS MAXIMUM VALUE OF ONE.

L ENTRY LEXICON USER'S PAGE NO. 3 EO S3

P0079 R0081	VARIABLE	DESCRIPTION	MAXIMUM VALUE	COMPUTER NAME
R0083	HEADSUP	INDICATOR FOR INITIAL ROLL	1	
R0084	KA	DRAG TO LIFT UP IF DOWN	805 FPSS	= KAT
R0086	KLAT	LATERAL SWITCH GAIN	1	(NOM = .0125)
R0088	K2ROLL	INDICATOR FOR ROLL SWITCH		
R0089	LAD	MAX L/D (MIN ACTUAL VEHICLE L/D)	1	
R0090	LADPAD	NOMINAL VEHICLE L/D, SP PAD LOAD	1	(NOM = 0.3)
R0092	LATANG	LATERAL RANGE	4 RADIANS	
R0093	LEQ	EXCESS C.F. OVER GRAV=(VSQ-1)GS	128.8 FPSS	
R0094	LEWD	UPCONTROL REFERENCE L/D	1	
R0095	LCD	FINAL PHASE L/D	1	(NOM = 0.18)
R0097	LCDPAD	FINAL PHASE L/D, SP PAD LOAD	1	
R0098	L/D	DESIRED LIFT TO DRAG RATIO	1	
R0099		(VERTICAL PLANE)		
R0100	L/D1	TEMP STORAGE FOR L/D IN LATERAL	1	
R0101	L/DCMINR	LAD COS(15DEG)	1	(NOM = 0.2895)
R0103	PREDANGL	PREDICTED RANGE (FINAL PHASE)	2700 NM	= PREDANG
R0105	Q2	FINAL PHASE RANGE -23500 Q3	21600 NM	
R0106		Q2 = FCN(LAD)		
R0107	Q7	MINIMUM DRAG FOR UPCONTROL	805 FPSS	
R0108	RDOT	ALTITUDE RATE	2 VSAT	
R0109	RDOTREF	REFERENCE RDOT FOR UPCONTROL	2 VSAT	
R0110	RDTR	REFERENCE RDOT FOR DOWNCONT	2 VSAT	NOT SAVED
R0112	RDLLC	ROLL COMMAND	1 REVOLUTION	
R0113	RTOGO	RANGE TO GO (FINAL PHASE)	2700 NM	= FX +2
R0115	SL	SINE OF LATITUDE	1	NOT SAVED
R0117	T	TIME	B 28 CENTISEC	= TIME2,TIME1
R0119	THETA	DESIRED RANGE (RADIANS)	2 PI RADIANS	= THETAH
R0121	THETNM	DESIRED RANGE (NM)	21600 NM	NON EXISTENT
R0123	V	VELOCITY MAGNITUDE	2 VSAT	
R0124	V1	INITIAL VELOCITY FOR UPCONTROL	2 VSAT	
R0125	VL	EXIT VELOCITY FOR UPCONTROL	2 VSAT	
R0126	VREF	REFERENCE VELOCITY FOR UPCONTROL	2 VSAT	
R0127	VS1	VSAT OR V1, WHICHEVER IS SMALLER	2 VSAT	
R0128		$2 \quad 2$		
R0129	VEARS	$VL^2/VSAT^2$	4	
R0130		$2 \quad 2$		
R0131	VSQ	NORMALISED VEL. SQUARED = $V^2/VSAT^2$	4	= VSQUARE
R0133	W1	EARTH RATE TIMES TIME	1 REVOLUTION	NOT SAVED
R0135				= WIE (DTEAROT)
R0137	X	INTERMEDIATE VARIABLE IN G-LIMITER	2 VSAT	NOT SAVED
R0139	Y	LATERAL MISS LIMIT	4 RADIANS	NOT SAVED

P0141 EXTRA COMPUTER ERASABLE LOCATIONS NOT SHOWN ON FLOW CHARTS
R0142 ----------

R0143 R0144	VARIABLE	DESCRIPTION	MAXIMUM VALUE
R0145	GOTOADDR	ADDRESS SELECTED BY SEQUENCER	
R0146	XPIPBUF	BUFFER TO STORE X PIPA COUNTS	
R0147	YPIPBUF	BUFFER TO STORE Y PIPA COUNTS	
R0148	ZPIPBUF	BUFFER TO STORE Z PIPA COUNTS	
R0149	PIPCTR	COUNTS PASSES THRU PIPA READ ROUTINE	
R0150	JJ	INDEX IN FINAL PHASE TABLE LOOK-UP	
R0151	MM	INDEX IN FINAL PHASE TABLE LOOK-UP	
R0152	GRAD	INTERPOLATION FACTOR IN FINAL PHASE	
R0153	FX	DRANGE/D L/D = F3	2700 NM
R0154	FX + 1	AREF	805 FPSS
R0155	FX + 2	RTOGO	2700 NM
R0156	FX + 3	RDOTREF	VSAT/4
R0157	FX + 4	DRANGE/D RDOT = F2	21600/2VS NM/FPS
R0158	FX + 5	DRANGE/D DRAG = F1	2700/805 NM/FPSS
R0159	TEM1B	TEMPORARY LOCATION	
R0160	TIME/RTO	TIME OF INITIAL TARGET RTINIT	B 28 CENTISEC
R0161	DTEARCT	EST TIME BETWEEN RTINIT AND RT	B 28 CENTISEC
R0162	-		
R0163	UNITV	UNIT V VECTOR	2
R0164	-		
R0165	UNITR	UNIT R VECTOR	2
R0166	-		
R0167	-VREL	NEGATIVE VELOCITY REL TO ATMOSP	2 VSAT

R0168 R0170	COMPUTER SWITCHES		INITIAL STATE	CM/FLAGS = STATE +6
R0172	ENTRYDSP	DO ENTRY DISPLAY, IF SET	NON-BRANCH (1)	92D, BIT13
R0174	GONEPAST	INDICATES OVERSHOOT OF TARGET	NON-BRANCH (0)	95D, BIT10
R0176	RELVELSW	RELATIVE VELOCITY SWITCH	NON-BRANCH (0)	96D, BIT 9
R0178	EGSW	FINAL PHASE SWITCH	NON-BRANCH (0)	97D, BIT 8
R0180	FIRSTPAS	INITIAL PASS THRU HUNTEST	NON-BRANCH (0)	98D, BIT 7
R0182	HIND	INDICATES ITERATION IN HUNTEST	NON-BRANCH (0)	99D, BIT 6
R0184	INRLSW	INDICATES INIT ROLL ATTITUDE SET	NON-BRANCH (0)	100D, BIT 5
R0186	LATSW	INHIBIT DOWNLIFT SWITCH IF NOT SET	BRANCH (1)	101D, BIT 4
R0188	.05GSW	INDICATES DRAG EXCEEDS .05 GS	BRANCH (0)	102D, BIT 3
R0190	GONEBY	INDICATES GONE PAST TARGET (SET)	SELF-INITIALZNG	112D, BIT 8

L ENTRY LEXICON

	CONSTANTS AND GAINS		VALUE	
P0192				
R0194				
R0196	C1	FACTOR IN ALP COMPUTATION	1.25	
R0198	C16	CONSTD GAIN ON DRAG	.01	
R0200	C17	CONSTD GAIN ON RDOT	.001	
R0202	C18	BIAS VEL. FOR FINAL PHASE START	500	FPS
R0204	C20	MAX DRAG FOR DOWN-LIFT	175	FPSS
R0206	CHOOK	FACTOR IN AHOOK COMPUTATION	.25	
R0208	CH1	FACTOR IN GAMMAL COMPUTATION	1.0	
R0210	COS15	COS(15 DEG)	.965	
R0212	DLEWDO	INITIAL VARIATION IN LEWD	-.05	
R0214	D2	DRAG TO CHANGE LEWD	175	FPSS
R0216	D1	COMPUTATION CYCLE TIME INTERVAL	2	SEC.
R0218	GMAX	MAXIMUM ACCELERATION	257.6	FPSS (8 G-S)
R0220	KA1	FACTOR IN KA CALC	1.3 GS	
R0222	KA2	FACTOR IN KA CALC	.2 GS	
R0224	KA3	FACTOR IN DO CALC	90 FPSS	
R0226	KA4	FACTOR IN DO CALC	40 FPSS	
R0228	KB1	OPTIMIZED UPCONTROL GAIN	3.4	
R0230	KB2	OPTIMIZED UPCONTROL GAIN	.0034	
R0232	KDMIN	INCREMENT ON Q7 TO DETECT END OF KEPLER PHASE	.5	FPSS
R0234	K1ETA	TIME OF FLIGHT CONSTANT	1000	
R0236	KLAT1	FACTOR IN KLAT CALC	1/24	
R0238	K44	GAIN USED IN INITIAL ROLL SECTION	19749550 FPS	
R0240	LATBIAS	LATERAL SWITCH BIAS TERM	.41252961 NM	
R0242	LEWD1	NOMINAL UPCONTROL L/D	.15	
R0244	PCINT1	FACTOR TO REDUCE UPCONTROL GAIN	.1	
R0246	Q2	FINAL PHASE RANGE - 23500 Q3	-1002	NM
R0248	Q3	FINAL PHASE DRANGE/D V	.07	NM/FPS
R0250	Q5	FINAL PHASE DRANGE/ D GAMMA	7050	NM/RAD
R0252	Q6	FINAL PHASE INITIAL FLIGHT PATH ANGLE	.0349	RAD
R0254	Q7F	MIN DRAG FOR UPCONTROL	6	FPSS
R0256	Q7MIN	MIN VALUE FOR Q7 IN FACTOR CALCULATION	40	FPSS
R0258	Q19	FACTOR IN GAMMAL1 CALCULATION	.5	
R0260	Q21	FACTOR IN Q2 CALCULATION.	1000	NM
R0262	Q22	FACTOR IN Q2 CALCULATION.	-1302	NM
R0264	VFINAL1	VELOCITY TO START FINAL PHASE ON INITIAL ENTRY	27000	FPS
R0266	VFINAL	FACTOR IN INITIAL UP-DOWN CALC	26600	FPS
R0268	VLMIN	MINIMUM VL	18000	FPS
R0270	VMIN	VELOCITY TO SWITCH TO RELATIVE VEL	VSAT/2	
R0272	VRCONTRL	ROOT TO START INTO HUNTEST	700	FPS
R0274		VRCONT = COMPUTER NAME		
R0275	25NM	TOLERANCE TO STOP RANGE ITERATION	25	NM
R0277	VQUIT	VELOCITY TO STOP STEERING	1000	FPS

P0279 CONVERSION FACTORS AND SCALING CONSTANTS
R0280 ---------- ------- --- ------- ---------

R0281	ATK	ANGLE IN RAD TO NM	3437.7468	NM/RAD
R0283	GS	NOMINAL G VALUE FOR SCALING	32.2	FPSS
R0285	HS	ATMOSPHERE SCALE HEIGHT	28500	FT
R0287	J	GRAVITY HARMONIC COEFFICIENT	.00162346	
R0289	KHE	EQUATORIAL EARTH RATE	1546.70168	FPS
R0291	MLE	EARTH GRAVITATIONAL CONSTANT	3.986032233 E 14	CUBIC M/ SEC SEC
R0293	RE	EARTH RADIUS	21202900	FT
R0295	REQ	EARTH EQUATORIAL RADIUS	20925738.2	FT
R0297	VSAT	SATELLITE VELOCITY AT RE	25766.1973	FPS
R0299	WIE	EARTH RATE	.0000729211505	RAD/SEC

A0301 (END GSOP AS-278, VOL 1, FIG. 5.6-3 CONSTANTS,GAINS, ETC.)

R0302 DISPLAY QUANTITIES
R0303 ----------

R0304 (SEE SECTION 4 OF THE GSOP FOR SIGN CONVENTIONS.)

R0305	VARIABLE	DESCRIPTION	MAXIMUM VALUE	
R0306	--------	-----------	------- -----	
R0307	GMAX	PREDICTED MAXIMUM ENTRY ACCEL	163.84 GS	N 60
R0309	VPRED	PREDICTED VELOCITY AT ALTITUDE	128 M/CENTISEC	N 60
R0311		400K FT ABOVE FISCHER RADIUS.		
R0312	GAMMAEI	PREDICTED GAMMA AT ALTITUDE	1 REVOLUTION	N 60
R0314		400K FT ABOVE FISCHER RADIUS.		
R0315	D	DRAG ACCELERATION	805 FPSS	N 64
R0317	VMAGI	INERTIAL VELOCITY MAGNITUDE	128 M/CENTISEC	N 64, N 68
R0319	THETAH	DESIRED RANGE ANGLE NM	1 REVOLUTION	N 64, N 67
R0321	LAT	PRESENT LATITUDE	1 REVOLUTION	N 67
R0323	LONG	PRESENT LONGITUDE	1 REVOLUTION	N 67
R0325	RTOGO	RANGE ANGLE TO SPLASH FROM	1 REVOLUTION	N 63
R0327		EMSALT FT ABOVE FISCHER RADIUS. (IN NM)		
R0328	VIO	PREDICTED VELOCITY AT ALTITUDE	128 M/CENTISEC	N 63
R0330		EMSALT FT ABOVE FISCHER RADIUS.		
R0331	TTE	TIME OF FREE FALL TO ALT	8 28 CENTISEC	N 63
R0333		EMSALT FT ABOVE FISCHER RADIUS.		
R0334	RCLLC	ROLL COMMAND	1 REVOLUTION	N 66, N 68, N 69
R0336	LATANG	CROSS-RANGE ERROR (XRNGERR)	4 RADIANS	N 66
R0338	DNRNGERR	DOWN RANGE ERROR	1 REVOLUTION	N 66
R0340		(PREDANG - THETAH IN NM)		
R0341	HDOT	ALTITUDE RATE	128 M/CENTISEC	N 68
R0343	Q7	MINIMUM DRAG FOR UPCONTROL	805 FPSS	N 69
R0345	VL	EXIT VELOCITY FOR UP-CONTROL	2 VSAT	N 69

P0347 BODY ATTITUDE QUANTITIES (CM/POSE)
R0348 ----------

R0349	VARIABLE	DESCRIPTION	MAXIMUM VALUE
R0350	--------	-----------	------- -----
R0351	-		
R0352	-\REL	NEGATIVE VELOCITY REL TO ATMOS.	2 VSAT
R0353	-		
R0354	CLDUYA	USED FOR UYA BELOW 1000 FPS	2
R0355	-		
R0356	UXA/2	UNIT VECTOR TRIAD	2
R0357	-		
R0358	UYA/2	BASED ON	2
R0359	-		
R0360	UZA/2	THE TRAJECTORY.	2
R0361	-		
R0362	UBX/2	UNIT VECTOR	2
R0363	-		
R0364	UBY/2	BODY TRIAD	2
R0365	-		
R0366	UBZ/2	FOR CM.	2

L REENTRY CONTROL USER'S PAGE NO. 1 EO S3

R0001 ENTRY INITIALIZATION ROUTINE
R0002 ----------

```
 0003                        25,2000                    BANK   25
 0004  REF   1               25,2000                    SETLOC REENTRY
 0005                        25,2000                    BANK

 0006  REF   1                                          COUNT* $$/ENTRY
 0007  REF   7  LAST  747    E7,1451                    EBANK= RTINIT

 0008  REF   6  LAST  65E       4753          EBENTRY  =       EBANK7
 0009  REF  11  LAST  65E       4752          EBAOG    EQUALS  EBANK6
 0010  REF   8  LAST  776       4675          NTRYPRIO EQUALS  PRIO20        (SERVICER)
 0011  REF  48  LAST  698       0102          CM/FLAGS EQUALS  STATE +6

 0012                        25,2000  77776 1  STARTENT EXIT                 MM = 63
A0013                                                        COME HERE FROM  CM/POSE . RESTARTED IN CM/POSE.

 0014  REF   1               25,2001  4 2113 1          CS      ENTMASK      INITIALIZE ALL SWITCHES TO ZERO
A0015                                                                        EXCEPT LATSW, ENTRYDSP AND GONEPAST.
A0016                                                                        GONEBY 1120 BIT8 FLAG7,SELF INITIALIZING
 0017                        25,2002  0 0004 0          INHINT
 0018  REF   5  LAST  775    25,2003  7 0102 0          MASK    CM/FLAGS
A0019                                                                        ENTRYDSP = 92D  B13
A0020                                                                        GONEPAST=95D B10,  RELVELSW=96D B9
A0021                                                                        EGSW = 97D  B8
A0022                                                                        HIND=99D B6        INRLSW=100D B5
A0023                                                                        LATSW=101D B4      .05GSW=102D B3

 0024  REF   1               25,2004  6 2114 1          AD      ENTRYSW      SET ENTRYDSP, LATSW, GONEPAST.
 0025  REF   6  LAST  795    25,2005  54 102 0          TS      CM/FLAGS

 0026                        25,2006  0 0003 1          RELINT

 0027  REF 205  LAST  782    25,2007  0 6006 1          TC      INTPRET

 0028                        25,2010  77735 0           SLOAD
 0029  REF   1               25,2011  03011 1                   LODPAD
 0030  REF   2  LAST  115    25,2012  03626 0           STORE   LOD

 0031                        25,2013  77735 0           SLOAD
 0032  REF   1               25,2014  03010 0                   LADPAD
 0033  REF   2  LAST  115    25,2015  03624 1           STORE   LAD

 0034                        25,2016  77605 1           DMP                  L/DCMINR = LAD COS(15)
 0035  REF   1               25,2017  15320 1                   COS15
 0036  REF   2  LAST  115    25,2020  17630 1           STODL   L/DCMINR
 0037  REF   1               25,2021  15145 0                   LATSLOPE
 0038                        25,2022  70405 1           DMP     SR1          KLAT = LAD/24
 0039  REF   3  LAST  795    25,2023  03624 1                   LAD
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0040  REF   2  LAST  115  25,2024  17632 C        STCDL  KLAT
0041  REF   1             25,2025  15176 C               Q7F
0042  REF   2  LAST  274  25,2026  17175 1        STODL  Q7          Q7 = Q7F
0043  REF   1             25,2027  17334 C               NEARONE     1.0 -18IT
0044  REF   2  LAST  115  25,2030  17614 1        STODL  FACTOR
0045  REF   4  LAST  795  25,2031  03624 1               LAD
0046                      25,2032  57565 C        SIGN   DCOMP
0047  REF   6  LAST  744  25,2033  03327 1               HEADSUP     MAY BE NOISE FOR DISPLAY P61
0048  REF   2  LAST  115  25,2034  37634 1        STCALL L/D         L/D = - LAD SGN(HEADSUP)

0049  REF   2  LAST  741  25,2035  52063 C               STARTEN1    RETURN VIA GOTOADDR
0050                      25,2036  47375 C        VLOAD  VXV
0051  REF  14  LAST  787  25,2037  01177 1               VN          (-7) M/CS
0052  REF   4  LAST  786  25,2040  01760 1               UNITR       .5 UNIT          REF COORDS
0053                      25,2041  50256 C        UNIT   DOT
0054  REF   4  LAST  767  25,2042  03474 C               RT          RT/2  TARGET VECTOR      REF COORDS
0055  REF   4  LAST  172  25,2043  03676 C        STORE  LATANG      LATANG = UNI.RT /4
0056                      25,2044  47076 C        DCOMP  RTB
0057  REF  13  LAST  401  25,2045  45707 C               SIGNMPAC
0058  REF   2  LAST  115  25,2046  17644 1        STODL  K2ROLL      K2ROLL = -SGN(LATANG)

0059  REF   5  LAST  796  25,2047  03624 1               LAD
0060                      25,2050  43205 1        DMP    DAD
0061  REF   1             25,2051  15200 1               Q21
0062  REF   1             25,2052  15202 C               Q22
0063  REF   2  LAST  116  25,2053  03712 C        STORE  Q2          Q2 = -1152 + 50C LAD

0064                      25,2054  66331 C        SSP    SSP
0065  REF   3  LAST  749  25,2055  03646 C               GOTOADDR    SET SELECTOR FOR INITIAL PASS
0066  REF   1             25,2056  52260 1               INITROLL
0067  REF   4  LAST  746  25,2057  03325 C               POSEXIT
0068  REF   1             25,2060  52115 C               SCALEPOP    SET CM/POSE TO CONTINUE AT SCALEPOP

0069                      25,2061  77634 C        RTB
0070  REF   2  LAST  753  25,2062  53603 1               SERVNOUT    OMIT INITIAL DISPLAY, SINCE IST GUESSBAD

R0071  CALCULATE THE INITIAL TARGET VECTOR:  RTINIT,  ALSO RTEAST, RTNORM  AND  RT.    ALL ARE .5 UNIT AND IN
R0073   REFERENCE COORDINATES.

0074                      25,2063  77220 1  STARTEN1 STQ    VLOAD
0075  REF   4  LAST  796  25,2064  03645 C           GOTOADDR
0076  REF   8  LAST  632  25,2065  03401 1           LAT(SPL)    TARGET COORDINATES
0077                      25,2066  43014 C     CLEAR CLEAR       DO CALL USING PAD RADIUS. WILL UNIT IT.
0078  REF  10  LAST  753  25,2067  00662 C           ERADFLAG    ANYWAY.
0079  REF  19  LAST  753  25,2070  01663 C           LUNAFLAG
0080  REF  10  LAST  632  25,2071  15104 C     STODL LAT
0081  REF   1             25,2072  15332 1           3ZEROS

0082  REF  11  LAST  796  25,2073  15110 C     STODL LAT +4      SET ALT=0.
0083  REF  13  LAST  780  25,2074  01205 1           PIPTIME     ESTABLISH RTINIT AT TIME OF PRESENT
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A0084                                                                   RN AND VN.
 0085   REF  2  LAST  115   25,2075  37524 C          STCALL TIME/RTO    SAVE TIME BASE OF RTINIT.
 0086   REF  7  LAST  727   25,2076  26373 1                 LALOTORV    C(MPAC) =TIME   (PIPTIME)
 0087                       25,2077  77656 1          UNIT               ANSWER IN ALPHAV ALSO
 0088   REF  8  LAST  795   25,2100  17452 1          STODL  RTINIT      .5 UNIT TARGET          REF COORDS
 0089   REF  1              25,2101  12112 C                 500SEC      NOMINAL ENTRY TIME FOR P63
A0090                                                                   TIME/RTO = PIPTIME, STILL.
 0091   REF  7  LAST  767   25,2102  37606 C          STCALL DTEAROT     INITIALIZE EARROT
 0092   REF  1              25,2103  46215 C                 EARROT1     GET RT
 0093                       25,2104  72441 C          DOT    SL1
 0094   REF  5  LAST  796   25,2105  01760 1                 UNITR       RT/2 IN MPAC
 0095                       25,2106  77726 1          ACOS
 0096   REF  2  LAST  116   25,2107  37702 C          STCALL THETAH      RANGE ANGLE /360
 0097   REF  5  LAST  796   25,2110  03645 C                 GOTOADDR    RETURN TO CALLER

 0098                       25,2111  00003 1  500SEC  2DEC  50000 B-28    CS
 0098                       25,2112  01520 1
 0099                       25,2113  11774 C  ENTMASK OCT   11774
 0100                       25,2114  11010 C  ENTRYSW OCT   11010        ENTRYDSP B13, GONEPAST B10, LATSW B4
```

```
P0101
 0102                          25,2115   77624 1  SCALEPOP CALL
 0103  REF   1                 25,2116   52125 C                   TARGETNG

 0104                          25,2117   77776 1          EXIT

 0105  REF  66  LAST  781      25,2120   0 5301 0  REFAZE10 TC      PHASCHNG
 0106                          25,2121    10035 C          OCT     10035          SERVICER 5.3 RESTART AT REFAZE10

 0107  REF 206  LAST  795      25,2122   0 6006 1          TC      INTPRET

R0108          JUMP TO PARTICULAR RE-ENTRY PHASE:

                                                 SEQUENCE
A0109
 0110                          25,2123   77650 1          GOTO
 0111  REF   6  LAST  797      25,2124   03645 C                   GOTOADDR

R0112

R0113          GOTOADDR  CONTAINS THE ADDRESS OF THE ROLL COMMAND EQUATIONS APPROPRIATE TO THE CURRENT PHASE OF
R0115  RE-ENTRY.  SEQUENCING IS AS FOLLOWS:

R0116  INITROLL ADDRESS IS SET HERE INITIALLY. HOLDS INITIAL ROLL ATTITUDE UNTIL KAT  IS EXCEEDED. THEN HOLDS NEW ROLL
R0118          ATTITUDE UNTIL  VATHRESH  IS EXCEEDED.  THEN BRANCHES TO

R0119  HUNTEST  THIS SECTION CHECKS TO SEE IF THE PREDICTED RANGE AT NOMINAL  L/D FROM PRESENT CONDITIONS IS LESS
R0121          THAN THE DESIRED RANGE.
R0122            IF NOT - A ROLL COMMAND IS GENERATED BY THE CONSTANT DRAG CONTROLLER.
R0124            IF SO -  CONTROL AND GOTOADDR ARE SET TO  UPCONTRL.
R0125          USUALLY NO ITERATION IS INVOLVED EXCEPT IF THE RANGE DESIRED IS TOO LONG ON THE FIRST PASS THROUGH
R0127          HUNTEST.

R0128  UPCONTRL CONTROLS ROLL DURING THE SUPER-CIRCULAR PHASE.  UPCONTRL IS TERMINATED EITHER
R0130            (A)  WHEN THE DRAG (AS MEASURED BY THE PIPAS) FALLS BELOW Q7 ,  OR
R0132            (B)  IF ROOT IS NEGATIVE AND REFERENCE VL EXCEEDS V.
R0133          IN CASE (A),  GOTOADDR  IS SET TO  KEP2  AND IN CASE (B), TO PREDICT3  SKIPPING THE KEPLER PHASE OF
R0135          ENTRY.

R0136  KEP2     GOTOADDR IS SET HERE DURING THE KEPLER PHASE TO MONITOR DRAG. THE SPACECRAFT IS INSTANTANEOUSLY
R0138          TRIMMED IN PITCH AND YAW TO THE COMPUTED RELATIVE VELOCITY. THE LAST COMPUTED ROLL ANGLE IS MAINTAINED.
R0140          WHEN THE MEASURED DRAG EXCEEDS Q7 +0.5,  GOTOADDR  IS SET TO

R0141  PREDICT3 THIS CONTROLS THE FINAL SUB-ORBITAL PHASE. ROLL COMMANDS CEASE
R0142          WHEN  V  IS LESS THAN VQUIT. AN EXIT IS MADE TO

R0143  P67.1    THE LAST COMPUTED ROLL ANGLE IS MAINTAINED. RATE DAMPING IS DONE IN PITCH AND YAW. PRESENT LATITUDE
R0145          AND LONGITUDE ARE COMPUTED FOR DISPLAY.
R0146          ENTRY IS TERMINATED WHEN DISKY RESPONSE IS MADE TO TC THIS FINAL FLASHING DISPLAY.
```

```
P0148    PROCESS AVERAGE G OUTPUT...SCALE IT AND GET INPUT DATA
R0149

R0150    * START TARGETING ...

 0151    REF   9  LAST  797   E7,1451                    EBANK= RTINIT

A0152                                                    TARGETNG IS CALLED BY P61, FROM GROUP 4.
A0153                                                    TARGETNG IS CALLED BY ENTRY, FROM GROUP 5.

A0154                                                                ALL MM COME HERE.
 0155                          25,2125   77214 0  TARGETNG BOFF   VLOAD      ENTER WITH PROPER EB FROM CM/POSE(TEST)
 0156    REF   1               25,2126   03346 0                 RELVELSW    RELVELSW = 960  BIT9
 0157    REF   1               25,2127   52133 1                 GETVEL      WANT INERTIAL VEL. GO GET IT.
 0158    REF   2  LAST  115    25,2130   03526 0                 -VREL       NEW V  IS RELATIVE, CONTINUE

 0159                          25,2131   52076 1          VCOMP  GOTO        (VREL) = (V) + KWE UNITR*UNITW
 0160    REF   1               25,2132   52136 1                 GETUNITV -1 - VREL WAS LEFT BY CM/POSE

 0161                          25,2133   74375 0  GETVEL  VLOAD  VXSC        INERTIAL V WANTED
 0162    REF  15  LAST  796    25,2134   01177 1                 VN          KVSCALE = (12800 / .3048) / 2VS
 0163    REF   1               25,2135   15230 1                 KVSCALE     KVSCALE = .81491944
 0164    REF   2  LAST  115    25,2136   03516 0          STORE  VEL         V/2 VS

 0165                          25,2137   44056 1  GETUNITV UNIT  STQ
 0166    REF   6  LAST  767    25,2140   03373 0                 GOGENRET
 0167    REF   2  LAST  115    25,2141   17510 0          STODL  UNITV
 0168                          25,2142   00043 0                 34D
 0169    REF   2  LAST  115    25,2143   03622 1          STORE  VSQUARE     VSQ/4

 0170                          25,2144   77625 0          DSU                LEQ = VSQUARE - 1
 0171    REF   1               25,2145   15322 0                 FOURTH      4 G-S FULL SCALE
 0172    REF   2  LAST  115    25,2146   17654 0          STODL  LEQ         LEQ/4

 0173                          25,2147   00045 0                 36D
 0174    REF   2  LAST  116    25,2150   27674 1          STOVL  V           V/2 VS = VEL/2 VS

 0175    REF   3  LAST  799    25,2151   03516 0                 VEL
 0176                          25,2152   72441 0          DOT    SL1         RDOT= V.UNITR
 0177    REF   6  LAST  797    25,2153   01760 1                 UNITR
 0178    REF   3  LAST  274    25,2154   27700 0          STOVL  RDOT        RDOT / 2 VS

 0179    REF  10  LAST  787    25,2155   01163 1                 DELV        PIPA COUNTS IN PLATFORM COORDS.
 0180                          25,2156   41246 1          ABVAL  DMP
 0181    REF   1               25,2157   15232 0                 KASCALE
 0182                          25,2160   53152 1          SL1    BZE
 0183    REF   1               25,2161   55132 1                 SETMIND
 0184    REF   3  LAST  273    25,2162   27640 0  DSTORE  STOVL  D           ACCELERATION USED TO APPROX DRAG
 0185    REF   4  LAST  799    25,2163   03516 0                 VEL
 0186                          25,2164   53435 0          VXV    UNIT        UNI = UNIT(V*R)
```

```
0187  REF  7 LAST 799  25,2165  01760 1            UNITR
0188  REF  4 LAST 763  25,2166  03502 0      STORE UNI          .5 UNI                    REF COORDS.

0189                   25,2167  71214 0      BOFF  DLOAD
0190  REF  2 LAST 799  25,2170  03346 0            RELVELSW
0191  REF  1           25,2171  55073 0            GETETA
0192  REF  2 LAST 796  25,2172  15332 1            3ZEROS
0193                   25,2173  43225 0 UPDATERT DSU  DAD          PIPTIME-TIME/RTO =ELAPSED TIME SINCE
A0194                                               RTINIT  WAS ESTABLISHED.
0195  REF  3 LAST 797  25,2174  03524 1            TIME/RTO
0196  REF 14 LAST 796  25,2175  01205 1            PIPTIME
0197  REF  8 LAST 797  25,2176  37606 0      STCALL DTEAROT     GET PREDICTED TARGET VECTOR  RT

0198  REF  3 LAST 767  25,2177  46225 0            EARROT2
0199                   25,2200  40241 1      DOT   SETPD        SINCE (RT) UNIT VECT, THIS IS 1/4 MAX
0200  REF  5 LAST 800  25,2201  03502 0            UNI          LATANG = RT.UNI
0201                   25,2202  00001 0            0
0202  REF  5 LAST 796  25,2203  27676 0      STOVL LATANG       LATANG = MAC LATANG / 4

0203  REF  5 LAST 796  25,2204  03474 0            RT
0204                   25,2205  77614 1      CLEAR
0205  REF  1           25,2206  03667 0            GONEBY       SHOW HAVE NOT GONE PAST TARGET.
0206                   25,2207  50235 0      VXV   DOT          IF RT*UNITR.UNI NEG, GONEBY=1
0207  REF  8 LAST 800  25,2210  01760 1            UNITR        GONEPAST IS CONDITIONAL SW SET IN
0208  REF  6 LAST 800  25,2211  03502 0            UNI          FINAL PHASE.
0209                   25,2212  43044 0      BPL   SET
0210                   25,2213  52215 0            +2
0211  REF  2 LAST 800  25,2214  03467 1            GONEBY       SHOW HAVE     GONE PAST TARGET.

0212                   25,2215  77775 1      VLOAD
0213  REF  6 LAST 800  25,2216  03474 0            RT
0214                   25,2217  45241 1 GETANGLE DOT  DSU        THETA = ARCCOS(RT.UNITR)
0215  REF  9 LAST 800  25,2220  01760 1            UNITR
0216  REF  1           25,2221  15162 0            NEAR1/4      TO IMPROVE ACCURACY, CALC RANGE BY
0217                   25,2222  43244 1      BPL   DAD          TINYTHET IF HIGH ORDER PART OF
0218  REF  1           25,2223  55135 0            TINYTHET     ARCCOS ARGUMENT IS ZERO
0219  REF  2 LAST 800  25,2224  15162 0            NEAR1/4
0220                   25,2225  65552 0      SL1   ACOS
0221  REF  3 LAST 797  25,2226  03702 1 THETDONE STORE THETAH     THETAH/360
A0222                                               HI WORD, LO BIT =1.32 NM=360 60/16384

0223                   25,2227  57414 1      BON   DCOMP
0224  REF  3 LAST 800  25,2230  03707 1            GONEBY       =1 IF HAVE GONE PAST TARGET.
A0225                                               (SIGN MAY BECOME ERRATIC VERY NEAR
A0226                                               TARGET DUE TO LOSS OF PRECISION.)
0227                   25,2231  52232 0            +1
0228  REF  2 LAST 274  25,2232  17714 0      STODL RTGO&67      RANGE ERROR: NEG IF WILL FALL SHORT.

0229  REF  4 LAST 799  25,2233  03640 0            D
0230                   25,2234  50025 0      DSU   BMN
```

```
0231   REF   1                25,2235   15240 0                .05G
0232   REF   1                25,2236   52255 1                NO.05G
0233                           25,2237   77214 0          SET   VLOAD
0234   REF   1                25,2240   03074 1                .05GSW
0235   REF   8  LAST  787     25,2241   03433 0                DELVREF
0236                           25,2242   50206 0          PUSH  DOT
0237   REF   5  LAST  769     25,2243   03542 1                UXA/2
0238                           25,2244   63552 0          SL1   DSQ
0239                           25,2245   47515 0          PDVL  VSQ          EXCHANGE WITH PDL.
0240                           25,2246   56225 1          DSU   DDV
0241                           25,2247   00001 0                0
0242                           25,2250   75400 1          BOV   SQRT
0243   REF   1                25,2251   52253 1                NOLDCALC     OVFL LAST CLEARED IN EARROT2 ABOVE.
0244   REF   1                25,2252   03727 0          STORE L/DCALC

0245                           25,2253   77650 1  NOLDCALC GOTO
0246   REF   7  LAST  799     25,2254   03373 0                GOGENRET

0247                           25,2255   52014 0  NO.05G  CLEAR GOTO          THIS WAY FOR DAP.(MAY INTERRUPT)
0248   REF   2  LAST  801     25,2256   03274 0                .05GSW       .05GSW = 102D  83
0249   REF   2  LAST  801     25,2257   52253 1                NOLDCALC     KEEP SINGLE EXIT FOR TARGETNG
```

P0250 SUBROUTINES CALLED BY SCALEPOP (TARGETING):

```
 0251                          26,3073                    BANK   26
 0252  REF   1                 26,2000                    SETLOC REENTRY1
 0253                          26,3073                    BANK

 0254  REF   1                                            COUNT* $$/ENTRY

 0255                          26,3073  56345 C  GETETA   CLOAD  DDV        D = D +D(-RDOT/HS -2D/V)  DT/2
A0256                                                                     DT/2  =  2/2  = 1
 0257  REF   4  LAST  799     26,3074  03700 C           RDOT
 0258  REF   1                 26,3075  15314 C           -HSCALED
 0259                          26,3076  41325 C  PDDL     DMP
 0260  REF   5  LAST  800     26,3077  03640 C           D
 0261  REF   1                 26,3100  15316 1           -KSCALE
 0262                          26,3101  43271 1  DDV      DAD
 0263  REF   3  LAST  799     26,3102  03674 1           V
A0264                                                                     -RDOT/HS FROM PDL.
 0265                          26,3103  43205 1  DMP      DAD
 0266  REF   6  LAST  802     26,3104  03640 C           D
 0267  REF   7  LAST  802     26,3105  03640 C           D
 0268  REF   8  LAST  802     26,3106  03640 C  STORE    D

 0269                          26,3107  71214 C  BON      DLOAD      EGSW INDICATES FINAL PHASE.
 0270  REF   2  LAST   55      26,3110  03307 C           EGSW
 0271  REF   1                 26,3111  55116 1           SUBETA
 0272  REF   4  LAST  800     26,3112  03702 1           THETAH
 0273                          26,3113  52005 C     DMP   GOTO
 0274  REF   1                 26,3114  15234 C           KTETA      = 1000X2PI/(2)E14 163.84
 0275  REF   1                 26,3115  52173 C           UPDATERT

 0276                          26,3116  45345 1  SUBETA   DLOAD  DSU        SWITCH FROM  INERTIAL TO RELATIVE VEL.
 0277  REF   4  LAST  802     26,3117  03674 1           V
 0278  REF   1                 26,3120  15322 C           VMIN
 0279                          26,3121  43044 C     BPL   SET
 0280  REF   1                 26,3122  55124 C           SUBETA2
 0281  REF   3  LAST  800     26,3123  03066 1           RELVELSW

 0282                          26,3124  41345 C  SUBETA2  DLOAD  DMP

 0283  REF   5  LAST  802     26,3125  03702 1           THETAH
 0284  REF   1                 26,3126  15236 1           KT1        KT1 = KT
 0285                          26,3127  52071 C     DDV   GOTO
 0286  REF   5  LAST  802     26,3130  03674 1           V          KT = RE(2 PI)/2 VS 16384 163.84/ 2 VSAT
 0287  REF   2  LAST  802     26,3131  52173 C           UPDATERT

 0288                          26,3132  52145 C  SETMIND  DLOAD  GOTO
 0289  REF   2  LAST  632     26,3133  16326 1           1BITDP
 0290  REF   1                 26,3134  52162 C           DSTORE
```

```
0291                          26,3135  51425 C  TINYTHET DSU     ABS          ENTER WITH X-.249
0292  REF  3  LAST  802       26,3136  16327 C                   1BITDP + 1   GET 1/4 - MPAC
0293                          26,3137  75461 C            SL     SQRT         SCALE UP BEFORE SQRT
0294                          26,3140  20216 C                   13D          HAS FACTOR FOR UP SCALING
0295                          26,3141  52005 C            DMP    GOTO
0296  REF  1                  26,3142  15246 C                   KACOS
0297  REF  1                  26,3143  52226 C                   THETDONE
```

L REENTRY CONTROL

F0298 * START INITIAL ROLL ...

```
 0299                          25,2260                 BANK   25
 0300  REF   2 LAST  795       25,2000                 SETLOC REENTRY
 0301                          25,2260                 BANK

 0302  REF   2 LAST  795 TO  802:   176   176*        COUNT* $$/ENTRY

A0303                                                                  MM = 63 , 64 ..
 0304                          25,2260  43014 C  INITROLL BON    BOFF  IF D- .05G NEG, GO TO LIMITL/D
 0305  REF   1                 25,2261  03312 1                INRLSW
 0306  REF   1                 25,2262  52354 1                INITRL1
 0307  REF   3 LAST  801       25,2263  03354 C                .05GSW
 0308  REF   1                 25,2264  53521 1                LIMITL/D

A0309                                                                  MM = 64, NOW

A0310                                                                                3
A0311                                                                  KA = KA1 LEQ   + KA2
 0312                          25,2265  63545 C        DLOAD  DSQ
 0313  REF   3 LAST  799       25,2266  03654 C               LEQ
 0314                          25,2267  56205 C        DMP    DDV
 0315  REF   4 LAST  804       25,2270  03654 C               LEQ
 0316  REF   1                 25,2271  15304 1               1/KA1          = 25 /(64  1.8)
 0317                          25,2272  47015 C        DAD    RTB
 0318  REF   1                 25,2273  15306 C               KA2            = .2
 0319  REF   1                 25,2274  54432 C               P64            ROLLC          VI             RDOT
A0320                                                                        XXX.XX DEG     XXXXX. FPS     XXXXX. FPS
 0321  REF   2 LAST  116       25,2275  03720 1        STORE  KAT

 0322                          25,2276  45345 1        DLOAD  DSU            IF V-VFINAL1 NEG, GO TO FINAL PHASE.
 0323  REF   6 LAST  802       25,2277  03674 1               V
 0324  REF   1                 25,2300  15302 1               VFINAL1
 0325                          25,2301  51014 C        CLEAR  BPL            (CAN'T CLEAR INRLSW AFTER HERE:RESTARTS)
 0326  REF   1                 25,2302  03265 C               GONEPAST       GONEPAST WAS INITIALLY SET=1 TO FORCE
A0327                                                                        ROLLC TO REMAIN AS DEFINED BY HEADSUP
A0328                                                                        UNTIL START OF P64. (UNTIL D > .05G)
 0329  REF   1                 25,2303  52310 1               DOEQ
 0330                          25,2304  52131 C        SSP    GOTO
 0331  REF   7 LAST  798       25,2305  03646 C               GOTOADDR
 0332  REF   1                 25,2306  53311 1               KEP2           AND IDLE UNTIL D>0.2 G.  (NO P66 HERE)
 0333  REF   1                 25,2307  52343 1               INROLOUT       GO TO LIMITL/D AFTER SETTING INRLSW.

 0334                          25,2310  41345 C  DOEQ  DLOAD  DMP            DO = KA3 LEQ + KA4
 0335  REF   5 LAST  804       25,2311  03654 C               LEQ
 0336  REF   1                 25,2312  15310 1               KA3
 0337                          25,2313  77615 C        DAD
 0338  REF   1                 25,2314  15312 C               KA4
 0339  REF   2 LAST  116       25,2315  03710 1        STORE  DO             DO/805
 0340                          25,2316  40065 C        BDDV   BOV
```

L REENTRY CONTROL

```
0341  REF  1                25,2317  15266 1                 C001      (-4/25 G)  8-8
0342                        25,2320  52321 0                 +1        CLEAR OVFIND, IF ON.
0343  REF  2  LAST  116     25,2321  17706 0          STODL  C/DO      (-4/DO)  8-8
0344  REF  6  LAST  796     25,2322  03624 1                 LAD       IF V-VFINAL +K(RDOT/V)CUBED POS,L/D=-LAD
0345  REF  3  LAST  796     25,2323  17634 0          STODL  L/D
0346  REF  5  LAST  802     25,2324  03700 0                 RDOT
0347                        25,2325  41471 0          DDV    PUSH
0348  REF  7  LAST  804     25,2326  03674 1                 V
0349                        25,2327  41316 0          DSQ    DMP
0350                        25,2330  45271 1          DDV    DSU
0351  REF  1                25,2331  15276 0                 1/K44
0352  REF  1                25,2332  15300 0                 VFINAL
A0353                                                                                    3
A0354                                                       V-VFINAL +(RDOT/V)  / K44   OVFL $

0355                        25,2333  40015 1          DAD    BOV
0356  REF  8  LAST  805     25,2334  03674 1                 V
0357  REF  2  LAST  804     25,2335  52343 1                 INROLOUT  GO TO LIMITL/D AFTER SETTING INRLSW.
0358                        25,2336  71240 1          BMN    DLOAD
0359  REF  3  LAST  805     25,2337  52343 1                 INROLOUT  GO TO LIMITL/D AFTER SETTING INRLSW.
0360  REF  7  LAST  805     25,2340  03624 1                 LAD
0361                        25,2341  77676 0          DCOMP
0362  REF  4  LAST  805     25,2342  03634 0          STORE  L/D

A0363                                                       SET INRLSW AT END FOR RESTART PROTECTION
 0364                       25,2343  77614 1  INROLCUT BOFSET          END OF PRE .05G PATH OF INITROLL.
0365  REF  2  LAST  804     25,2344  03052 0                 INRLSW    SWITCH IS ZERO INITIALLY.
0366  REF  2  LAST  804     25,2345  53521 1                 LIMITL/D  (GO TO)

0367                        25,2346  45345 1  KATEST  DLOAD  DSU       IF KAT - D POS, GO TO CONSTD
0368  REF  3  LAST  804     25,2347  03720 1                 KAT
0369  REF  9  LAST  802     25,2350  03640 0                 D         IF POS, OUT WITH COMMAND VIA LIMITL/D
0370                        25,2351  52044 0          BPL    GOTO
0371  REF  3  LAST  805     25,2352  53521 1                 LIMITL/D
0372  REF  1                25,2353  53224 0                 CONSTD

0373                        25,2354  43345 1  INITRL1  DLOAD  DAD       IF ROOT + VRCONT POS, GO TO HUNTEST
0374  REF  6  LAST  805     25,2355  03700 0                 RDOT
0375  REF  1                25,2356  15260 1                 VRCONT
0376                        25,2357  45040 1          BMN    CALL      IF POSITIVE, FALL INTO HUNTEST.
0377  REF  1                25,2360  52346 1                 KATEST

03771 REF  1                25,2361  53014 1                 FOREHUNT  INITIALIZE HUNTEST.
```

```
P0378   * START   HUNT TEST   ..

A0379                                                                   MM = 64
 0380                          25,2362   77731 1          SSP           INITIALIZE HUNTEST ON FIRST PASS
 0381   REF   8  LAST  804    25,2363   03646 0                GOTOADDR
 0382   REF   1               25,2364   52365 0                HUNTEST  MUST GO AFTER FOREHUNT FOR RESTARTS.

 0389                          25,2365   77745 1  HUNTEST  DLOAD
 0390   REF  10  LAST  805    25,2366   03640 0                D
 0391   REF   2  LAST  116    25,2367   17664 0          STODL A1      A1/805  = A1/ 25G

 0392   REF   8  LAST  805    25,2370   03624 1                LAD
 0393   REF   2  LAST  115    25,2371   17647 1          STODL TEM1B
 0394   REF   7  LAST  805    25,2372   03700 0                RDOT
 0395                          25,2373   71240 1          BMN   DLOAD   IF ROOT NEG,TEM1B=LAD, OTHERWISE = LEWD
 0396   REF   1               25,2374   52400 1                AOCALC
 0397   REF   1               25,2375   03725 1                LEWD
 0398   REF   3  LAST  806    25,2376   17647 1          STODL TEM1B

 0399   REF   8  LAST  806    25,2377   03700 0                RDOT
 0400                          25,2400   43271 1  AOCALC  DDV   DAD     V1 = V + ROOT/TEM1B
 0401   REF   4  LAST  806    25,2401   03647 1                TEM1B
 0402   REF   5  LAST  805    25,2402   03674 1                V
 0403   REF   2  LAST   69    25,2403   14326 0          STODL V1      V1/2 VS

 0404   REF   9  LAST  806    25,2404   03700 0                RDOT
 0405                          25,2405   56316 0          DSQ   DDV     AQ=(V1/V)SQ(D+RDOT SQ/(TEM1B 2 C1 HS)
 0406   REF   5  LAST  806    25,2406   03647 1                TEM1B
 0407                          25,2407   43271 1          DDV   DAD
 0408   REF   1               25,2410   15272 1                2C1HS
 0409   REF  11  LAST  806    25,2411   03640 0                D
 0410                          25,2412   41205 0          DMP   DMP
 0411   REF   3  LAST  806    25,2413   00326 0                V1
 0412   REF   4  LAST  806    25,2414   00326 0                V1
 0413                          25,2415   77671 1          DDV
 0414   REF   3  LAST  799    25,2416   03622 1                VSQUARE
 0415   REF   1               25,2417   14330 1          STODL AQ      AQ/805  = AQ/ 25G

 0416   REF  10  LAST  806    25,2420   03700 0                RDOT
 0417                          25,2421   71244 0          BPL   DLOAD
 0418   REF   1               25,2422   52425 0                V1LEAD
 0419   REF   2  LAST  806    25,2423   00330 1                AQ
 0420   REF   3  LAST  806    25,2424   03664 0          STORE A1      A1/25G

 04202                         25,2425   51145 0  V1LEAD  DLOAD BPL     IF L/D NEG, V1=V1 - 1000
 04203  REF   5  LAST  805    25,2426   03634 0                L/D
 04204  REF   1               25,2427   52434 0                HUNTEST1

 04205                         25,2430   45345 1          DLOAD DSU
 04206  REF   5  LAST  806    25,2431   00326 0                V1
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04207  REF  1                  25,2432  15214 1                VQUIT
04208  REF  6  LAST  806       25,2433  00326 0         STORE  V1

0421                           25,2434  41345 0  HUNTEST1 DLOAD  DMP      ALP = 2 C1 HS AO/LEWD V1 V1
0422   REF  3  LAST  806       25,2435  00330 1                AO
0423   REF  2  LAST  806       25,2436  15272 1                2C1HS
0424                           25,2437  40271 1         DDV    SETPD
0425   REF  7  LAST  807       25,2440  00326 0                V1
0426                           25,2441  00001 0                0
0427                           25,2442  56271 0         DDV    DDV
0428   REF  8  LAST  807       25,2443  00326 0                V1
0429   REF  2  LAST  806       25,2444  03725 1                LEWD
0430   REF  2  LAST  116       25,2445  03704 1         STORE  ALP

0431                           25,2446  55221 0         BDSU   BDDV     FACT1 = V1 / (1 - ALP)
0432   REF  1                  25,2447  17334 0                BARELY1
0433   REF  9  LAST  807       25,2450  00326 0                V1
0434   REF  2  LAST  119       25,2451  17616 0         STODL  FACT1    FACT1 / 2VS

0435   REF  3  LAST  807       25,2452  03704 1                ALP
0436                           25,2453  41225 1         DSU    DMP      FACT2 = ALP(ALP - 1) / AO
0437   REF  2  LAST  807       25,2454  17334 0                BARELY1
0438   REF  4  LAST  807       25,2455  03704 1                ALP
0439                           25,2456  77671 1         DDV
0440   REF  4  LAST  807       25,2457  00330 1                AO
0441   REF  2  LAST  115       25,2460  03620 0         STORE  FACT2    FACT2  (25G)

0442                           25,2461  43205 1         DMP    DAD
0443   REF  3  LAST  796       25,2462  03175 1                Q7       Q7 /805 = Q7 / 25G
0444   REF  5  LAST  807       25,2463  03704 1                ALP      VL=FACT1 (1-SQRT(Q7 FACT2 +ALP)  )
0445                           25,2464  44366 1         SQRT   BDSU
0446   REF  3  LAST  807       25,2465  17334 0                BARELY1
0447                           25,2466  77605 1         DMP
0448   REF  3  LAST  807       25,2467  03616 0                FACT1
0449   REF  2  LAST  274       25,2470  03767 1         STORE  VL       VL / 2 VS

0450                           25,2471  41221 0         BDSU   DMP      GAMMAL1 = LEWD (V1-VL)/VL
0451   REF  10 LAST  807       25,2472  00326 0                V1
0452   REF  3  LAST  807       25,2473  03725 1                LEWD
0453                           25,2474  77671 1         DDV
0454   REF  3  LAST  807       25,2475  03767 1                VL
0455   REF  1                  25,2476  14027 1         STODL  GAMMAL1  GAMMAL1 USED IN UPCONTROL

A0456                                                          GAMMAL1 = PDL 22D.
0457   REF  4  LAST  807       25,2477  03767 1                VL
0458                           25,2500  50025 0         DSU    BMN      IF VL-VLMIN NEG, GO TO PREFINAL
0459   REF  1                  25,2501  15204 0                VLMIN
0460   REF  1                  25,2502  53326 0                PREFINAL

0461                           25,2503  63545 0         DLOAD  DSQ
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L REENTRY CONTROL

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0462  REF   5  LAST  807   25,2504  03767 1                VL
0463  REF   2  LAST  116   25,2505  17666 1          STODL VBARS      VBARS / 4 VS VS

0464  REF   1              25,2506  15330 0                HALVE      IF VSAT-VL  NEG,  GO TO CONSTD
0465                       25,2507  50025 0          DSU   BMN
0466  REF   6  LAST  808   25,2510  03767 1                VL
0467  REF   1              25,2511  53220 1                BECONSTD   SET MODE=HUNTEST, CONTINUE IN CONSTD
0468  REF   2  LAST  116   25,2512  17662 0          STODL DVL        DVL / 2VS

0469  REF   2  LAST  808   25,2513  15330 0                HALVE
0470  REF   2  LAST  116   25,2514  03672 1          STORE VS1        VS1 = VSAT

0471                       25,2515  50025 0          DSU   BMN        IF V1 GREATER THAN VSAT , GO ON
0472  REF  11  LAST  807   25,2516  00326 0                V1
0473  REF   1              25,2517  52525 1                GETDHOOK
0474                       25,2520  77621 1          BDSU
0475  REF   3  LAST  808   25,2521  03662 0                DVL
0476  REF   4  LAST  808   25,2522  17662 0          STODL DVL        DVL = DVL - (VSAT-V1) = V1 - VL
0477  REF  12  LAST  808   25,2523  00326 0                V1
0478  REF   3  LAST  808   25,2524  03672 1          STORE VS1        VS1 = V1,  IN THIS CASE

0479                       25,2525  45145 0 GETDHOOK DLOAD  CALL     DHOOK=((1-VS1/FACT1) SQ -ALP)/FACT2
0480  REF   4  LAST  808   25,2526  03672 1                VS1        VS1 /2 VS
0481  REF   1              25,2527  52776 0                DHOOKYQ7   GO CALC DHOOK
0482  REF   2  LAST  115   25,2530  03656 1          STORE DHOOK      DHOOK /256

0483                       25,2531  56261 1          SR    DDV
0484                       25,2532  20606 0                5          CHOOK
0485  REF   4  LAST  807   25,2533  03175 1                Q7
0486                       25,2534  77625 0          DSU
0487  REF   1              25,2535  15250 1                CHOOK      = 1  (-5)  = .25 /8
0488  REF   2  LAST  116   25,2536  03660 1          STORE AHOOKDV

0489                       25,2537  41215 1          DAD   DMP        GAMMAL= GAMMAL1-CH1 DVL SQ(1+AHOOK DVL)
0490  REF   1              25,2540  15252 0                1/8TH                                /DHOOK VBARS
0491  REF   1              25,2541  15254 0                CH1
0492                       25,2542  41205 0          DMP   DMP
0493  REF   5  LAST  808   25,2543  03662 0                DVL
0494  REF   6  LAST  808   25,2544  03662 0                DVL
0495                       25,2545  56271 0          DDV   DDV
0496  REF   3  LAST  808   25,2546  03656 1                DHOOK
0497  REF   3  LAST  808   25,2547  03666 1                VBARS
0498                       25,2550  50021 1          BDSU  BMN
0499  REF   2  LAST  807   25,2551  00027 1                GAMMAL1
0500  REF   1              25,2552  52743 0                NEGAMA
0501  REF   1              25,2553  03771 0 HUNTEST3 STORE GAMMAL

0502                       25,2554  77625 0          DSU              GAMMAL1=GAMMAL1 +Q19 (GAMMAL-GAMMAL1)
0503  REF   3  LAST  808   25,2555  00027 1                GAMMAL1
0504                       25,2556  43205 1          DMP   DAD
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L REENTRY CONTROL

```
0505   REF   1                  25,2557   15330 C                 Q19
0506   REF   4   LAST   808     25,2560   00027 1                 GAMMAL1
0507   REF   5   LAST   809     25,2561   14027 1          STODL  GAMMAL1
0508   REF   2   LAST   808     25,2562   03771 C                 GAMMAL
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P0509    *START   RANGE PREDICTION ...

A0510                                                          C(MPAC) = GAMMAL
 0511                          25,2563  60516 C  RANGER  DSQ    SR2     COSG = 1-GAMMAL SQ/2, TRUNCATED SERIES
 0512                          25,2564  77621 1          BDSU
 0513  REF  3  LAST  808      25,2565  15330 C          HALVE
 0514  REF  2  LAST  116      25,2566  17670 C          STODL   COSG/2
 0515  REF  4  LAST  808      25,2567  03666 1          VBARS   E=SQRT(1+VBARS.......

 0516                          25,2570  41225 1          DSU     DMP
 0517  REF  4  LAST  810      25,2571  15330 C          HALVE
 0518  REF  5  LAST  810      25,2572  03666 1          VBARS
 0519                          25,2573  41205 C          DMP     DMP
 0520  REF  3  LAST  810      25,2574  03670 C          COSG/2
 0521  REF  4  LAST  810      25,2575  03670 C          COSG/2
 0522                          25,2576  43312 C          SL2     DAD
 0523  REF  1                  25,2577  17330 1          C1/16   C1/16 = 1/16
 0524                          25,2600  65366 1          SQRT    PDDL    E/4 INTO PDL

 0525  REF  6  LAST  810      25,2601  03666 1                  VBARS
 0526                          25,2602  41205 C          DMP     DMP     ASKEP/2 = ARCSIN(VBARS COSG SING/E)
 0527  REF  5  LAST  810      25,2603  03670 C                  COSG/2
 0528  REF  3  LAST  809      25,2604  03771 C                  GAMMAL
 0529                          25,2605  67471 1          DDV     ASIN
 0530                          25,2606  41552 C          SL1     PUSH    ASKEP TO PDL 0.
 0531  REF  1                  25,2607  17731 1          STODL   ASKEP   BALLISTIC RANGE       ASKEP/2PI

A0532                                                          FOR TM, STORE RANGE COMPONENTS OVERLAPPING (SP)
 0533  REF  7  LAST  808      25,2610  03767 1                  VL
 0534                          25,2611  43205 1          DMP     DAD     ASP1 = Q2 + Q3 VL
 0535  REF  1                  25,2612  15170 C                  Q3
 0536  REF  3  LAST  796      25,2613  03712 C                  Q2
 0537  REF  1                  25,2614  03732 1          STORE   ASP1    FINAL PHASE RANGE   ASP1/2 PI

 0538                          25,2615  63525 C          PDDL    DSQ     ASP1 TO PDL 2.
 0539  REF  13 LAST  808      25,2616  00326 C                  V1
A0540                                                                                2
A0541                                                          ASPUP= -C12 LOG(V1 Q7/VBARS A01/GAMMAL1
 0542                          25,2617  56205 C          DMP     DDV
 0543  REF  5  LAST  808      25,2620  03175 1                  Q7
 0544  REF  7  LAST  810      25,2621  03666 1                  VBARS
 0545                          25,2622  45071 C          DDV     CALL
 0546  REF  5  LAST  807      25,2623  00330 1                  A0
 0547  REF  1                  25,2624  46155 1                  LOG     RETURN WITH -LOG IN MPAC

 0548                          25,2625  56205 C          DMP     DDV
 0549  REF  1                  25,2626  15206 1                  C12
 0550  REF  6  LAST  809      25,2627  00027 1                  GAMMAL1
 0551  REF  1                  25,2630  03733 C          STORE   ASPUP   UP PHASE RANGE      ASPUP / 2 PI
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 0552                          25,2631  41325 C          PDDL    DMP       ASPUP TO PDL 4.
 0553  REF   1                 25,2632  15256 1                  KC3       KC3 =-4 VS VS/ 2 PI 805 RE
A0554                                                               ASPDWN = KC3 RDOT V / A0
 0555  REF  11  LAST  806      25,2633  03700 C                  RDOT
 0556                          25,2634  56205 C          DMP     DDV
 0557  REF  10  LAST  806      25,2635  03674 1                  V
 0558  REF   6  LAST  810      25,2636  00330 1                  A0
 0559                          25,2637  41471 C          DDV     PUSH      ASPDWN TO PDL 6.
 0560  REF   9  LAST  806      25,2640  03624 1                  LAD
 0561  REF   1                 25,2641  17734 1          STODL   ASPDWN    RANGE TO PULL OUT        ASPDWN /2 PI

 0562  REF   1                 25,2642  15174 1                  Q6
 0563                          25,2643  41225 1          DSU     DMP       ASP3 = Q5(Q6-GAMMAL)
 0564  REF   4  LAST  810      25,2644  03771 C                  GAMMAL
 0565  REF   1                 25,2645  15172 1                  Q5
 0566  REF   1                 25,2646  27735 C          STOVL   ASP3      GAMMA CORRECTION         ASP3/2PI

 0567  REF   2  LAST  810      25,2647  03731 1                  ASKEP     GET HI-WD AND
 0568  REF   1                 25,2650  17126 1          STODL   ASPS(TM)  SAVE HI-WORD OF ASP'S FOR TM.

 0569  REF   2  LAST  811      25,2651  03735 C                  ASP3
 0570                          25,2652  43215 C          DAD     DAD
A0571                                                               ASPDWN FROM PDL 6.
A0572                                                               ASPUP FROM PDL 4.
 0573                          25,2653  43215 C          DAD     DAD
A0574                                                               ASP1 FROM PDL 2.
A0575                                                               ASKEP FROM PDL 0.
 0576                          25,2654  41025 C          DSU     BOVB      CLEAR OVFIND.
 0577  REF   6  LAST  802      25,2655  03702 1                  THETAH
 0578  REF   3  LAST  755      25,2656  57314 C                  TCDANZIG
 0579  REF   2  LAST  115      25,2657  03610 C          STORE   DIFF      DIFF = (ASP-THETAH) /2 PI
A0580                                                       ASP=ASKEP+ASP1+ASPUP+ASP3+ASPDWN = TOTAL RANGE

 0581                          25,2660  45246 C          ABS     DSU       IF ABS(THETAH-ASP) -25NM NEG, GO TO UPSY
 0582  REF   1                 25,2661  15222 1                  25NM
 0583                          25,2662  43040 1          BMN     BDN
 0584  REF   1                 25,2663  53025 C                  GOTOUPSY
 0585  REF   1                 25,2664  03311 1                  HIND
 0586  REF   1                 25,2665  52671 C                  GETDLEWD

 0587                          25,2666  51145 C          DLOAD   BPL
 0588  REF   3  LAST  811      25,2667  03610 C                  DIFF
 0589  REF   1                 25,2670  53213 1                  DCONSTD   EVENTUALLY SETS MODE = HUNTEST.
 0590                          25,2671  41345 C  GETDLEWD DLOAD  DMP
A0591                                                               DLEWD = DLEWD (DIFF/(DIFFOLD-DIFF))
 0592  REF   2  LAST  115      25,2672  03642 1                  DLEWD
 0593  REF   4  LAST  811      25,2673  03610 C                  DIFF
 0594                          25,2674  45325 1          PDDL    DSU
 0595  REF   2  LAST  115      25,2675  03612 1                  DIFFOLD
 0596  REF   5  LAST  811      25,2676  03610 C                  DIFF
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0597                                25,2677   77665 1            BDDV
05971                               25,2700   77626 0  LWDSTORE  STADR
0598   REF   3  LAST  811           25,2701   74135 0            STORE   DLEWD
0599                                25,2702   50015 0            DAD     BMN       IF LEWD+DLEWD NEG,DLEWD=-LEWD/2
0600   REF   4  LAST  807           25,2703   03725 1            LEWD
06002  REF   1                     25,2704   52737 0            LEWDPTR
06004                               25,2705   77600 1            BOV
0601   REF   1                     25,2706   52733 1            LEWDOVFL
0602   REF   5  LAST  812           25,2707   03725 1            STORE   LEWD

0603                                25,2710   77776 1  SIDETRAK  EXIT

0604   REF   2  LAST  755           25,2711   3 4753 1           CA      EBENTRY
0605   REF  34  LAST  755           25,2712   54 003 0           TS      EBANK

06051  REF  10  LAST  379           25,2713   3 4763 1           CA      PRIO16    DROP GRP 5 RESTART PRIO TO 1 LESS THAN
06052  REF   1                     25,2714   55'064 0           TS      PHSPRDT5  GRP 4.

0606   REF  67  LAST  798           25,2715   0 5301 0           TC      PHASCHNG
0607                                25,2716    00474 0           OCT     00474     RESTART GRP 4 AT PRE-HUNT.
A06071                                                                             FORCE RESTART TO PICK UP IN GRP 4:
A06072                                                                             USE PRIO 17 FOR GRP 4( < SERVICER PRIO)
0608   REF  11  LAST  812           25,2717   3 4763 1           CA      PRIO16    CONTINUE GRP 5 AT LOWER PRIO THAN EITHER
A06081                                                                             GRP 4 OR SERVICER.
0609   REF  11  LAST  645           25,2720   0 5103 0           TC      PRIOCHNG

0610   REF   1                     25,2721   3 3024 1           CAF     ADENDEXT  SIDETRACK NEXT PASS UNTIL THIS ONE DONE.
0611   REF   9  LAST  806           25,2722   55'645 0           TS      GOTOADDR  ONLY AFTER RESTART IS LEFT AFTER DETOUR.

0612   REF 207  LAST  798           25,2723   0 6006 1           TC      INTPRET

0613                                25,2724   43145 0            DLOAD   SET
0614   REF   6  LAST  811           25,2725   03610 0            DIFF
0615   REF   2  LAST  811           25,2726   03071 1            HIND
0616   REF   3  LAST  811           25,2727   17612 1            STODL   DIFFCLD   DIFFCLD / 2 PI

0617   REF   2  LAST  796           25,2730   15176 0            Q7F
0621   REF   6  LAST  810           25,2731   37175 0            STCALL  Q7        Q7 / 805 FPSS
0622   REF   2  LAST  806           25,2732   52365 0                    HUNTEST    (GO TO )

0623                                25,2733   77745 1  LEWDOVFL  DLOAD
0624   REF   2  LAST  796           25,2734   17334 0                    NEARONE
0625   REF   6  LAST  812           25,2735   37725 0            STCALL  LEWD
0626   REF   2  LAST  811           25,2736   53213 1                    DCONSTD   (GO TO)  ALSO WILL SET MODE = HUNTEST

06262                               25,2737   70545 1  LEWDPTR   DLOAD   SR1
06264  REF   7  LAST  812           25,2740   03725 1            LEWD
06266                               25,2741   52076 1            DCOMP   GOTO
06268  REF   1                     25,2742   52700 1                    LWDSTORE
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R0627    NEGAMA IS PART OF HUNTEST ...

 0628                          25,2743   41205 C  NEGAMA   DMP     DMP          ENTER WITH GAMMAL IN MPAC
 0629  REF   8  LAST  810      25,2744   03767 1                   VL
 0630  REF   1                25,2745   15146 C                   1/3RD
 0631                          25,2746   41325 C           PDDL    DMP          PUSH GAMMAL VL/3
 0632  REF   8  LAST  812      25,2747   03725 1                   LEWD
 0633  REF   2  LAST  813      25,2750   15146 C                   1/3RD
 0634                          25,2751   43325 1           PDDL    DAD          PUSH LEWD/3
 0635  REF   3  LAST  808      25,2752   03660 1                   AHOOKDV
 0636  REF   1                25,2753   15145 C                   1/12TH
 0637                          25,2754   41205 C           DMP     DMP          DEL VL =(GAMMAL VL/3)/(LEWD/3-DVL
 0638  REF   7  LAST  808      25,2755   03662 0                   DVL          (2/3 + AHOOKDV)(CH1 GS/DHOOK VL))
 0639  REF   2  LAST  808      25,2756   15254 C                   CH1
 0640                          25,2757   56271 C           DDV     DDV
 0641  REF   4  LAST  808      25,2760   03656 1                   DHOOK
 0642  REF   9  LAST  813      25,2761   03767 1                   VL
 0643                          25,2762   55221 C           BDSU    BDDV
A0644                                                               LEWD/3
A0645                                                               GAMMAL VL /3
 0646                          25,2763   77615 C           DAD
 0647  REF  10  LAST  813      25,2764   03767 1                   VL
 0648  REF  11  LAST  813      25,2765   37767 C           STCALL  VL           VL/2 VS

 0649  REF   2  LAST  808      25,2766   52776 C                   DHOOKYQ7     GO CALC Q7
A0650                                                               Q7=((1-VL/FACT1)SQ - ALP)/FACT2
 0651  REF   7  LAST  812      25,2767   17175 1           STODL   Q7           Q7 / 25G

 0652  REF  12  LAST  813      25,2770   03767 1                   VL
 0653                          25,2771   77716 1           DSQ
 0654  REF   8  LAST  810      25,2772   17666 1           STODL   VBARS        VBARS / 4 VS VS

 0655  REF   3  LAST  800      25,2773   15332 1                   3ZEROS
 0656                          25,2774   77650 1           GOTO                 SET GAMMAL = 0
 0657  REF   1                25,2775   52553 C                   HUNTEST3

 0658                          25,2776   56342 1  DHOOKYQ7 SR1     DDV          SUBROUTINE TO CALC DHOOK OR Q7)
 0659  REF   4  LAST  807      25,2777   03616 0                   FACT1
 0660                          25,3000   72421 C           BDSU    SL1
 0661  REF   5  LAST  810      25,3001   15330 C                   HALVE
 0662                          25,3002   45316 1           DSQ     DSU
 0663  REF   6  LAST  807      25,3003   03704 1                   ALP
 0664                          25,3004   43471 1           DDV     RVQ
 0665  REF   3  LAST  807      25,3005   03620 C                   FACT2
```

P06651

A0666 COME TO PRE-HUNT WHEN RESTART OCCURS AFTER
A0667 HUNTEST IS SIDE-TRACKED AT SIDETRAK.
A0668 PICK UP IN GROUP 4.

```
 0669   REF 2C8  LAST  812   25,3006   0 6006 1  PRE-HUNT TC      INTPRET
 0670                       25,3007    45014 C            CLEAR   CALL
 0671   REF   3  LAST  812   25,3010    03271 C                    HIND        HIND       99D  BIT 6  FLAG 6
 0672   REF   2  LAST  805   25,3011    53014 1                    FOREHUNT    RE-INITIALIZE HUNTEST AFTER RE-START.
 0673                       25,3012    7765C 1            GOTO
 0675   REF   3  LAST  812   25,3013    52365 C                    HUNTEST

 0676                       25,3014    77745 1  FOREHUNT DLOAD                INITIALIZE HUNTEST.
 0677   REF   4  LAST  813   25,3015    15332 1                    3ZEROS
 0678   REF   4  LAST  812   25,3016    17612 1            STODL   DIFFCLC
 0679   REF   1               25,3017    15156 1                    DLEWDO
 0680   REF   4  LAST  812   25,3020    17642 1            STODL   DLEWD
 0681   REF   1               25,3021    15150 1                    LEWD1
 0682   REF   9  LAST  813   25,3022    03725 1            STORE   LEWD
 0683                       25,3023    77616 C            RVQ

A0684
 0685   REF   2  LAST  745   25,3024    53570 C  ADENDEXT CADR    ENDEXIT
```

L REENTRY CONTROL USER'S PAGE NO. 21 E7 S3

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P0686   # START  LF CONTROL  ...

A0687                                                                   MM = 65
 0688                       25,3025   77634 C  GOTOUPSY RTB              END OF HUNTEST
 0689   REF   1             25,3026   54440 C                 P65       HUNTEST USE OF GRP4 IS DISABLED BY P65
A0690                                                                   USE FOR DISPLAY.
A0691                                                                   SET MODE = UPCONTRL.
A0692                                                                   RETURN FROM P65 DIRECTLY TO UPCONTRL
A0693                                                                   VIA THE GOTOADDR AT REFAZE10.

 0694                       25,3027   45345 1  UPCONTRL DLOAD  DSU      IF D-140 POS, NOSWITCH =1
 06941  REF  12  LAST 806   25,3030   03640 C                  D        (SUPPRESS LATERAL SWITCH)
 06942  REF   1             25,3031   15220 C                  C21
 06943                      25,3032   43040 1           BMN    SET
 06944                      25,3033   53035 1                  +2
 06945  REF   1             25,3034   03070 C                  NOSWITCH

 06946                      25,3035   45345 1           DLOAD  DSU      IF  V-V1  POS, GO TO DOWN CONTROL.
 0695   REF  11  LAST 811   25,3036   03674 1                  V
 0696   REF  14  LAST 810   25,3037   00326 C                  V1
 0697                       25,3040   71244 C           BPL    DLOAD
 0698   REF   1             25,3041   53252 1                  DOWNCNTL
 0699   REF  13  LAST 815   25,3042   03640 C                  D
 0700                       25,3043   50025 C           DSU    BMN      IF D- Q7 NEG, GO TO KEP
 0701   REF   8  LAST 813   25,3044   03175 1                  Q7
 0702   REF   1             25,3045   53305 1                  KEP
 0703                       25,3046   51145 C           DLOAD  BPL      IF ROOT NEG, DO VLTEST
 0704   REF  12  LAST 811   25,3047   03700 C                  ROOT
 0705   REF   1             25,3050   53057 C                  CONT1

 0706                       25,3051   45345 1  VLTEST   DLOAD  DSU      IF V-VL-C18 NEG,EGSW=1,MODE=PREDICT3
 0707   REF  12  LAST 815   25,3052   03674 1                  V
 0708   REF  13  LAST 813   25,3053   03767 1                  VL
 0709                       25,3054   50025 C           DSU    BMN
 0710   REF   1             25,3055   15164 C                  C18
 0711   REF   2  LAST 807   25,3056   53326 C                  PREFINAL

 0712                       25,3057   77745 1  CONT1    DLOAD           IF D-A0 POS, L/D = LAD, GO TO LIMITL/D
 0713   REF  14  LAST 815   25,3060   03640 C                  D
 0714                       25,3061   50025 C           DSU    BMN
 0715   REF   7  LAST 811   25,3062   00330 1                  A0
 0716   REF   1             25,3063   53067 C                  CONT3
 0717                       25,3064   52145 C           DLOAD  GOTO
 0718   REF  10  LAST 811   25,3065   03624 1                  LAD
 0719   REF   1             25,3066   53520 C                  STOREL/D
A0720

 0721                       25,3067   41345 C  CONT3    DLOAD  DMP      VREF=FACT1(1-SQRT(FACT2 D + ALP))
 0722   REF  15  LAST 815   25,3070   03640 C                  D
 0723   REF   4  LAST 813   25,3071   03620 C                  FACT2
```

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0724                              25,3072  75415 C          DAD     SQRT
0725  REF   7  LAST  813         25,3073  03704 1                  ALP
0726                              25,3074  41221 C          BDSU    DMP
0727  REF   4  LAST  807         25,3075  17334 C                  BARELY1
0728  REF   5  LAST  813         25,3076  03616 C                  FACT1
0729  REF   1                   25,3077  01160 1          STORE   VREF          VREF / 2VS

0730                              25,3100  41221 C          BDSU    DMP          RDOTREF = LEWD(V1-VREF)
0731  REF  15  LAST  815         25,3101  00326 C                  V1
0732  REF  10  LAST  814         25,3102  03725 1                  LEWD
0733  REF   2  LAST   76         25,3103  15156 1          STODL   RDOTREF       RDOTREF / 2VS

0734  REF   5  LAST  808         25,3104  03672 1                  VS1
0735                              25,3105  50025 C          DSU     BMN          IF VSAT-VREF NEG, GO TO CONTINU2
0736  REF   2  LAST  816         25,3106  01160 1                  VREF
0737  REF   1                   25,3107  53126 1                  CONTINU2

0738                              25,3110  41406 C          PUSH    PUSH         VS1-VREF  TO PDL TWICE
0739                              25,3111  56205 C          DMP     DDV          RDHOOK=CH1(1+DV AHOOKDV/DVL) DV DV
0740  REF   4  LAST  813         25,3112  03660 1                  AHOOKDV           /DHOOK VREF
0741  REF   8  LAST  813         25,3113  03662 C                  DVL          WHERE  DV = (VS1-VREF)
0742                              25,3114  41215 1          DAD     DMP
0743  REF   2  LAST  808         25,3115  15252 C                  1/8TH
0744  REF   3  LAST  813         25,3116  15254 C                  CH1
0745                              25,3117  41205 C          DMP     DMP
A0746                                                               VS1-VREF  FROM PDL TWICE.
0747                              25,3120  77671 1          DDV
0748  REF   5  LAST  813         25,3121  03656 1                  DHOOK
0749                              25,3122  44271 C          DDV     BDSU
0750  REF   3  LAST  816         25,3123  01160 1                  VREF
0751  REF   3  LAST  816         25,3124  01156 1                  RDOTREF      C(RDOTREF)= LEWD (V1-VREF)
0752  REF   4  LAST  816         25,3125  01156 1          STORE   RDOTREF      RDOTREF = RDOTREF - RDHOOK

0753                              25,3126  45345 1 CONTINU2 DLOAD   DSU
0754  REF  16  LAST  815         25,3127  03640 C                  D
0755  REF   1                   25,3130  15312 C                  Q7MIN
0756                              25,3131  50004 C          BOVB    BMN
0757  REF   4  LAST  811         25,3132  57314 C                  TCDANZIG     CLEAR OVFL IND, IF ON.
0758  REF   1                   25,3133  53144 C                  UPCNTRL3
0759                              25,3134  45345 1          DLOAD   DSU
0760  REF   4  LAST  806         25,3135  03664 C                  A1
0761  REF   9  LAST  815         25,3136  03175 1                  Q7
0762                              25,3137  45325 1          PDDL    DSU
0763  REF  17  LAST  816         25,3140  03640 C                  D
0764  REF  10  LAST  816         25,3141  03175 1                  Q7
0765                              25,3142  45471 1          DDV     STADR
0766  REF   3  LAST  796         25,3143  74163 C          STORE   FACTOR       FACTOR / 25G
```

P0767 SKIPPER

A0768 DELTA L/D=-((RDOT-RDOTREF)F1 KB1+V-VREF)F1 KB2
A0769 WHERE F1 = FACTOR

```
 0770                          25,3144  77745 1  UPCNTRL3 DLOAD
 0771  REF  13  LAST  815      25,3145  03700 0           RDOT
 0772                          25,3146  41225 1      DSU  DMP          L/D = LEWD
 0773  REF   5  LAST  816      25,3147  01156 1           RDOTREF      -((RDOT-RDOTREF)F1/KB1+V-VREF)F1/KB2
 0774  REF   4  LAST  816      25,3150  03614 1           FACTOR
 0775                          25,3151  43271 1      DDV  DAD
 0776  REF   1                 25,3152  15210 0           1/KB1
 0777  REF  13  LAST  815      25,3153  03674 1           V
 0778                          25,3154  41225 1      DSU  DMP
 0779  REF   4  LAST  816      25,3155  01160 1           VREF
 0780  REF   5  LAST  817      25,3156  03614 1           FACTOR
 0781                          25,3157  41471 0      DDV  PUSH

 0782  REF   1                 25,3160  15212 1           -1/KB2       DELTA L/D INTO PDL
 0783                          25,3161  51400 1      BOV  ABS          NONLINEAR CIRCUIT FOR REDUCING HIGH GAIN
 0784  REF   1                 25,3162  53465 0           GOMAXL/D
 0785                          25,3163  50025 0      DSU  BMN
 0786  REF   1                 25,3164  15274 1           PT1/16
 0787  REF   1                 25,3165  53172 0           NEXT1
 0788                          25,3166  43205 1      DMP  DAD
 0789  REF   1                 25,3167  15152 0           POINT1
 0790  REF   2  LAST  817      25,3170  15274 1           PT1/16
 0791                          25,3171  41565 1      SIGN PUSH         ATTACH SIGN OF PUSH TO MPAC THEN PUSH

 0792                          25,3172  42545 0  NEXT1    DLOAD SL4
A0793                                                                 DELTA L/D FROM PDL.
 0794                          25,3173  77615 0      DAD
 0795  REF  11  LAST  816      25,3174  03725 1           LEWD
 0796                          25,3175  41400 0  NEGTESTS BOV  PUSH     L/D TO PDL FOR USE IN NEGTESTS.
 0797  REF   2  LAST  817      25,3176  53465 0           GOMAXL/D
 0798  REF   6  LAST  806      25,3177  17634 0      STODL L/D
A0799                                                                 IF D-C20 POS, LATSW =0
A0800                                                                 AND IF L/D NEG, L/D = 0.
 0801  REF  18  LAST  816      25,3200  03640 0           D
 0802                          25,3201  50025 0      DSU  BMN
 0803  REF   1                 25,3202  15216 0           C20
 0804  REF   4  LAST  805      25,3203  53521 1           LIMITL/D
 0805                          25,3204  71214 0      CLEAR DLOAD
 0806  REF   1                 25,3205  03273 1           LATSW        =210.  ROLL OVER TOP, REGARDLESS.
A0807                                                                 L/D FROM PDL.
 0808                          25,3206  71244 0      BPL  DLOAD
 0809  REF   5  LAST  817      25,3207  53521 1           LIMITL/D
 0810  REF   5  LAST  814      25,3210  15332 1           3ZEROS
 0811  REF   7  LAST  817      25,3211  37634 1      STCALL L/D
 0812  REF   6  LAST  817      25,3212  53521 1           LIMITL/D     (GO TO)
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0813                          25,3213  77745 1  DCONSTD  DLOAD            TWO RANGER ENTRIES TO CONSTD HERE
0814  REF   7  LAST  812       25,3214  03610 0                   DIFF
A0815                                                             SAVE OLD VALUE OF DIFF FOR NEXT PASS.
0817  REF   5  LAST  814       25,3215  17612 1           STODL   DIFFOLD          DIFFOLD / 2 PI

0818  REF   3  LAST  812       25,3216  15176 0                   Q7F
0819  REF  11  LAST  816       25,3217  03175 1           STORE   Q7

0820                          25,3220  47131 1  BECONSTD SSP     RTB              A HUNTEST ENTRY INTO CONSTD.
0821  REF  10  LAST  812       25,3221  03646 0                   GOTOADDR         RESET MODE TO HUNTEST
0822  REF   4  LAST  814       25,3222  52365 0                   HUNTEST
0823  REF   1                 25,3223  54505 0                   KILLGRP4         DEACTIVATE GRP4 FROM HUNTEST.

0824                          25,3224  77604 0  CONSTD   BOVB
0825  REF   5  LAST  816       25,3225  57314 0                   TCDANZIG         CLEAR OVF IND IF ON.

0826                          25,3226  41345 0           DLOAD   DMP
0827  REF   6  LAST  804       25,3227  03654 0                   LEQ
0828  REF   3  LAST  805       25,3230  03706 0                   C/DO             C/DO = -4/DO  B-8
0829                          25,3231  41325 0           PDDL    DMP              LEQ C/DO  INTO PDL
0830  REF   1                 25,3232  15262 0                   2HS              2HS / 4 VS VS
0831  REF   3  LAST  804       25,3233  03710 1                   DO
0832                          25,3234  43271 1           DDV     DAD              RDOTREF = - 2 HS DO/V
0833  REF  14  LAST  817       25,3235  03674 1                   V
0834  REF  14  LAST  817       25,3236  03700 0                   RDOT
0835                          25,3237  43205 1           DMP     DAD
0836  REF   1                 25,3240  15226 0                   K2D              C/DO LEQ + K2D(RDOT-RDOTREF) INTO PD
0837                          25,3241  77725 1           PDDL
0838  REF   4  LAST  818       25,3242  03710 1                   DO               DO /805

0839                          25,3243  77621 1  CONSTD1  BDSU                     ENTER WITH  DREF  IN MPAC
0840  REF  19  LAST  817       25,3244  03640 0                   D
0841                          25,3245  43205 1           DMP     DAD
0842  REF   1                 25,3246  15224 1                   K1D              K2D TERM FROM PUSH
0843                          25,3247  52061 1           SL      GOTO
0844                          25,3250  20211 1                   BD
0845  REF   1                 25,3251  53175 1                   NEGTESTS         (GO TO)

0846                          25,3252  77604 0  DOWNCNTL BOVB                     INITIAL PART OF UPCONTROL.
0847  REF   6  LAST  818       25,3253  57314 0                   TCDANZIG         CLEAR OVFIND , IF ON.

0848                          25,3254  54345 1           DLOAD   SR
0849  REF  11  LAST  815       25,3255  03624 1                   LAD
0850                          25,3256  20611 0                   BD
0851                          25,3257  45325 1           PDDL    DSU              RDTR = LAD(V1-V)
0852  REF  15  LAST  818       25,3260  03674 1                   V
0853  REF  16  LAST  816       25,3261  00326 0                   V1
0854                          25,3262  43205 1           DMP     DAD
0855  REF  12  LAST  818       25,3263  03624 1                   LAD
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 0856   REF  15  LAST  818   25,3264   03700 0          RDOT
 0857                        25,3265   43205 1    DMP   DAD
 0858   REF   2  LAST  818   25,3266   15226 0          K20
A0859                                                  PUSH UP LAD.
 0860                        25,3267   45325 1    PDDL  DSU        LAD + K20(RDOT-RDTR) INTO PD
 0861   REF  17  LAST  818   25,3270   00326 0          V1
 0862   REF  16  LAST  818   25,3271   03674 1          V
 0863                        25,3272   41316 0    DSQ   DMP
 0864   REF  13  LAST  818   25,3273   03624 1          LAD
 0865                        25,3274   65271 0    DDV   PDDL       (V1-V)SQ LAD/(2 C1 HS) INTO PD
 0866   REF   3  LAST  807   25,3275   15272 1          2C1HS
 0867   REF  18  LAST  819   25,3276   00326 0          V1
 0868                        25,3277   56316 0    DSQ   DDV
 0869   REF   4  LAST  806   25,3300   03622 1          VSQUARE
 0870                        25,3301   45265 1    BDDV  DSU        DREF = (V/V1)SQ A0 - PD
 0871   REF   8  LAST  815   25,3302   00330 1          A0
A0872                                                  PUSH UP HERE
 0873                        25,3303   77650 1    GOTO             C(MPAC) = DREF
 0874   REF   1              25,3304   53243 1          CONSTD1

A0875                                                        2          2
A0876                                          DREF = (V/V1)  A0 -(V-V1)  LAD/2 C1 HS
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P0877   * START  BALLISTIC PHASE  ...

A0878                                                                   MM = 66     UPCONTRL ENTRY INTO KEP2.
 0879                           25,3305   66234 1  KEP      RTB    SSP
 0880   REF   1                25,3306   54473 C                  P66          DISPLAY TRIM GIMBAL ANGLE VALUES.
 0881   REF  11  LAST  818     25,3307   03646 C                  GOTOADDR     SET GOTOADDR TO KEPLER PHASE.
 0882   REF   2  LAST  804     25,3310   53311 1                  KEP2

A0883                                                                   KEP2 CAN ALSO BE STARTED UP DIRECTLY FROM INITROLL
A0884                                                                   IN P64. PROGRAM WILL IDLE IN P64 UNTIL D EXCEEDS
A0885                                                                   .2 G BEFORE GOING ON TO P67.

 0886                           25,3311   45345 1  KEP2     DLOAD  DSU          IF Q7F+KOMIN -D NEG,GO TO FINAL PHASE.
 0887   REF   1                25,3312   15166 1                  Q7FKOMIN     (Q7F + KOMIN)/805
 0888   REF  20  LAST  818     25,3313   03640 C                  D
 0889                           25,3314   72240 1           BMN    TLOAD
 0891   REF   3  LAST  815     25,3315   53326 C                  PREFINAL

A0892                                                                   SET ROLLHOLD = ROLLC, IN CASE CMDAPMOD
 0893   REF   9  LAST  769     25,3316   03316 C                  ROLLC        = +1 EVER ENTERED.
 0894   REF 280  LAST  779     25,3317   00157 1           STORE  MPAC +2

 0895                           25,3320   72214 C           BON    TLOAD        IF D > .05G, KEEP PRESENT ROLL COMMAND.
 0896   REF   4  LAST  804     25,3321   03314 1                  .05GSW       IF D < .05G, SET ROLL COMMAND = 0.
 0897                           25,3322   53324 1                  +2
 0898   REF   6  LAST  817     25,3323   15332 1                  3ZERCS       SET ROLLC & ROLLHOLD =0.
 0899   REF  10  LAST  82C     25,3324   37316 1  +2      STCALL  ROLLC        (SP ROLLHOLD FOLLOWS DP ROLLC)
 0900   REF   3  LAST  745     25,3325   54402 C                  P62.3        CALC DESIRED GIMBAL ANGLES AT PRESENT
A0901                                                                   RN, VN  TO YIELD TRIM ATTITUDE.
A0902                                                                   AVAILABLE IN CPHI'S FOR N22.
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P0903 START FINAL PHASE ..

```
A0904                                                                   MM = 67
 0905                          25,3326   47131 1  PREFINAL SSP   RTB
 0906  REF  12  LAST  820     25,3327   03646 0                  GOTOADDR   RESTART PROTECT: RESET GOTOADDR IF CAME
 0907  REF   4  LAST  820     25,3330   53326 0                  PREFINAL   FROM HUNTEST.
 0908  REF   1                25,3331   54477 1                  P67        DISABLES GRP4. FINE IF FROM HUNTEST.BUT
A0909                                                                   MAY ALSO REMOVE RESTART PROTECTION OF
A0910                                                                   N69 (P65).
A0911                                                                   ROLLC        XRNGERR      DNRNGERR
A0912                                                                   XXX.XX DEG   XXXX.X NM    XXXX.X NM

 0913                          25,3332   66214 0            SET   SSP
 0914  REF   3  LAST  802     25,3333   03067 0                  EGSW
 0915  REF  13  LAST  821     25,3334   03646 0                  GOTOADDR
 0916  REF   1                25,3335   53336 1                  PREDICT3

 0917                          25,3336   45345 1  PREDICT3 DLOAD   DSU        IF V-VQUIT NEG, STOP STEERING
 0918  REF  17  LAST  819     25,3337   03674 1                  V
 0919  REF   2  LAST  807     25,3340   15214 1                  VQUIT
 0920                          25,3341   77440 1            BMN   EXIT
 0921  REF   1                25,3342   53605 1                  STEERCFF

 0922  REF   3  LAST  812     25,3343   3 4753 1           CA    EBENTRY    PRECAUTIONARY.
 0923  REF  35  LAST  812     25,3344   54 003 0           TS    EBANK

 0924  REF   1                25,3345   3 5660 1           CA    TWELVE
 0925  REF   1                25,3346   55'771 0  BACK     TS    JJ

 0926  REF  18  LAST  821     25,3347   4 1673 0           CS    V
 0927  REF   2  LAST  821     25,3350   51'771 1           INDEX JJ
 0928  REF   1                25,3351   6 3631 0           AD    VREFER     VREF - V, HIGHEST VREF AT END OF TABLE.
 0929  REF 182  LAST  779     25,3352   10 000 0           CCS   A          IF VREF-V POS LOOP BACK
 0930  REF   3  LAST  821     25,3353   11'771 0           CCS   JJ         DECREMENT JJ , JJ CANNOT BE ZERO
 0931  REF   1                25,3354   1 3346 1           TCF   BACK
 0932  REF  96  LAST  775     25,3355   6 4712 1           AD    ONE
 0933  REF   6  LAST  806     25,3356   55'646 0           TS    TEM1B      V-VREF IN TEM1B (MUST BE POSITIVE NUM)

 0934  REF   4  LAST  821     25,3357   51'771 1           INDEX JJ
 0935  REF   2  LAST  821     25,3360   4 3631 1           CS    VREFER
 0936  REF   5  LAST  821     25,3361   51'771 1           INDEX JJ
 0937  REF   3  LAST  821     25,3362   6 3632 0           AD    VREFER + 1 V(K+1) - V(K)     (POS NUM)
 0938  REF   7  LAST  821     25,3363   57'646 1           XCH   TEM1B
 0939                          25,3364   22 007 0           ZL
 0940                          25,3365   0 0006 1           EXTEND
 0941  REF   8  LAST  821     25,3366   11'646 0           DV    TEM1B
 0942  REF   2  LAST  115     25,3367   55'651 0           TS    GRAD       GRAD = (V-VREF)/(VK+1 - VK)   (POS NUM

 0943  REF  18  LAST  776     25,3370   3 4715 0           CAF   FIVE
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0944   REF   5  LAST  742   25,3371  55'650 1  BACK2   TS      MM
0945   REF   2  LAST  782   25,3372  3 4720 0          CAF     THIRTEEN
0946   REF   6  LAST  821   25,3373  27'771 0          ADS     JJ
0947   REF 183  LAST  821   25,3374  50 000 1          INDEX   A
0948   REF   4  LAST  821   25,3375  4 3631 1          CS      VREFER
0949   REF   7  LAST  822   25,3376  51'771 1          INDEX   JJ
0950   REF   5  LAST  822   25,3377  6 3632 0          AD      VREFER + 1      X(K+1) - X(K)
0951                        25,3400  0 0006 1          EXTEND
0952   REF   3  LAST  821   25,3401  7 1651 0          MP      GRAD
0953   REF   8  LAST  822   25,3402  51'771 1          INDEX   JJ
0954   REF   6  LAST  822   25,3403  6 3631 0          AD      VREFER
0955   REF   6  LAST  822   25,3404  51'650 0          INDEX   MM
0956   REF   2  LAST  115   25,3405  55'652 0          TS      FX              FX = AK + GRAD (AK+1 - AK)
0957   REF   7  LAST  822   25,3406  11'650 1          CCS     MM
0958   REF   1               25,3407  1 3371 0          TCF     BACK2
0959   REF   3  LAST  822   25,3410  57'653 0          XCH     FX +1           ZERO FX +1  AND GET DREFR
0960   REF  21  LAST  820   25,3411  6 1637 1          AD      D
0961                        25,3412  0 0006 1          EXTEND
0962   REF   4  LAST  822   25,3413  7 1657 0          MP      FX + 5           F1
0963   REF 281  LAST  820   25,3414  52 155 1          DXCH    MPAC            MPAC = F1(D-DREF)

0964                        25,3415  0 0006 1          EXTEND
0965   REF  16  LAST  819   25,3416  4 1700 0          DCS     RDOT            FORM RDOTREF - RDOT
0966                        25,3417  20 001 1          DDOUBL
0967                        25,3420  20 001 1          DDOUBL
0968                        25,3421  20 001 1          DDOUBL                  SCALE UP BY 8 FOR THIS PHASE.
0969   REF   5  LAST  822   25,3422  6 1655 0          AD      FX + 3           RDOTREF
0970                        25,3423  0 0006 1          EXTEND
0971   REF   6  LAST  822   25,3424  7 1656 1          MP      FX + 4           F2
0972   REF   7  LAST  822   25,3425  6 1654 1          AD      FX +2           RTOGO
0973   REF 282  LAST  822   25,3426  20 155 1          DAS     MPAC            ADD F2(DADV1-DADVR)
0974   REF 283  LAST  822   25,3427  3 0154 1          CA      MPAC
0975   REF   2  LAST  116   25,3430  55'770 1          TS      PREDANG
A0976                                                                        L/D = LOD +(THETA- PREDANG)/ Y
0977   REF 209  LAST  814   25,3431  0 6006 1          TC      INTPRET

0978                        25,3432  45242 1           SR3     DSU
0979   REF   7  LAST  811   25,3433  03702 1                   THETAH
0980                        25,3434  43014 0           BON     BOFF
0981   REF   2  LAST  804   25,3435  03305 1                   GONEPAST
0982   REF   1               25,3436  53463 0                   GONEGLAD
0983   REF   4  LAST  800   25,3437  03747 0                   GONEBY
0984   REF   1               25,3440  53446 1                   HAVDNRNG
0985                        25,3441  43145 0           DLOAD   SET             SET GONEPAST IF GONEBY SET & LATCH IN -
0986   REF   1               25,3442  13765 1                   MAXRNG          DISPLAY = 9999.9 IF GONEBY          PLACE
0987   REF   3  LAST  822   25,3443  03065 1                   GONEPAST
0988   REF   3  LAST  274   25,3444  37716 0           STCALL  DNRNGERR
0989   REF   2  LAST  822   25,3445  53463 0                   GONEGLAD

0990   REF   4  LAST  822   25,3446  03716 1  HAVDNRNG STORE   DNRNGERR        = (PREDANG - THETA) /360
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0991                          25,3447  77676 C          DCOMP                    FALL SHORT IF NEG, OVERSHOOT IF POS
0993                          25,3450  56204 1          BOVB     DDV
0994  REF  7  LAST  818      25,3451  57314 C                   TCDANZIG         CLEAR OVFIND IF ON.
0995  REF  8  LAST  822      25,3452  03653 1                   FX               FX= DRANGE/D L/D = Y
0996                          25,3453  40061 1          SL       BOV
0997                          25,3454  20206 1                   5
0998  REF  3  LAST  817      25,3455  53465 C                   GOMAXL/D
0999                          25,3456  40015 1          DAD      BOV
1000  REF  3  LAST  795      25,3457  03626 C                   LOD
1001  REF  4  LAST  823      25,3460  53465 C                   GOMAXL/D
1002  REF  8  LAST  817      25,3461  37634 1          STCALL   L/D
1003  REF  1                  25,3462  53471 C                   GLIMITER         (GO TO)

R1004  GONEGLAD  AND GOPOSMAX  ENTRY POINTS FOR  GLIMITER  ...

1005                          25,3463  77745 1  GONEGLAD DLOAD                    SET L/D = -LAD
1006  REF  3  LAST  822       25,3464  13464 C                   GONEGLAD         (ANY NEGATIVE NUMBER WILL DO)

1007                          25,3465  41234 1  GOMAXL/D RTB     DMP              L/D = LAD SIGN(MPAC)
1008  REF 14  LAST  796       25,3466  45707 C                   SIGNMPAC
1009  REF 14  LAST  819       25,3467  03624 1                   LAD
1010  REF  9  LAST  823       25,3470  03634 C          STORE    L/D              AND FALL INTO GLIMITER SECTION

1011                          25,3471  45345 1  GLIMITER DLOAD   DSU              IF GMAX/2-D POS, GO TO LIMITL/D
1012  REF  1                  25,3472  15160 1                   GMAX/2
1013  REF 22  LAST  822       25,3473  03640 C                   D
1014                          25,3474  43244 1          BPL      DAD              IF GMAX  -D NEG, GO TO GOPOSLAD
1015  REF  7  LAST  817       25,3475  53521 1                   LIMITL/D
1016  REF  2  LAST  823       25,3476  15160 1                   GMAX/2
1017                          25,3477  41240 1          BMN      DMP
1018  REF  1                  25,3500  53516 C                   GOPOSLAD
1019  REF  2  LAST  818       25,3501  15262 C                   2HS
1020                          25,3502  41325 C          PDDL     DMP              2HS(GMAX-D) INTO PD
1021  REF  7  LAST  818       25,3503  03654 C                   LEQ
1022  REF  1                  25,3504  15330 C                   1/GMAX
1023                          25,3505  41215 1          DAD      DMP
1024  REF 15  LAST  823       25,3506  03624 1                   LAD
1025                          25,3507  56325 C          PDDL     DDV              2HS(GMAX-D) (LEQ/GMAX+LAD) INTO PD
1026  REF  1                  25,3510  15264 C                   2HSGMXSQ
1027  REF  5  LAST  819       25,3511  03622 1                   VSQUARE
1028                          25,3512  75415 C          DAD      SQRT             XLIM = SQRT(PD+(2HSGMAX/V)SQ)
1029                          25,3513  51015 1          DAD      BPL              IF ROOT+XLIM POS, GO TO LIMITL/D
1030  REF 17  LAST  822       25,3514  03700 C                   ROOT
1031  REF  8  LAST  823       25,3515  53521 1                   LIMITL/D

1032                          25,3516  77745 1  GOPOSLAD DLOAD
1033  REF 16  LAST  823       25,3517  03624 1                   LAD
1034  REF 10  LAST  823       25,3520  03634 C  STOREL/D STORE   L/D
```

```
1035                                25,3521   77745 1  LIMITL/D DLOAD
1036  REF  11  LAST  823            25,3522   03634 0                   L/D
1037  REF   3  LAST  172            25,3523   17636 1           STODL   L/D1
1038  REF   6  LAST  823            25,3524   03622 1                   VSQUARE

1039                                25,3525   77614 1           BON                 NO LATERAL CONTROL IF PAST TARGET
1040  REF   4  LAST  822            25,3526   03305 1                   GONEPAST
1041  REF   1                      25,3527   53561 0                   L355
1042                                25,3530   43205 1           DMP     DAD         Y= KLAT VSQUARE + LATBIAS
1043  REF   3  LAST  796            25,3531   03632 0                   KLAT
1044  REF   1                      25,3532   15242 1                   LATBIAS     Y INTO PD
1045                                25,3533   51525 1  L350     PDDL    ABS         IF ABS(L/D)-L/DCMINR NEG, GO TO L353
1046  REF  12  LAST  824            25,3534   03634 0                   L/D
1047                                25,3535   50025 0           DSU     BMN
1048  REF   3  LAST  795            25,3536   03630 1                   L/DCMINR
1049  REF   1                      25,3537   53546 0                   L353
1050                                25,3540   75345 1           DLOAD   SIGN        IF K2ROLL LATANG NEG, GO TO L357
1051  REF   6  LAST  80C            25,3541   03676 0                   LATANG
1052  REF   3  LAST  796            25,3542   03644 1                   K2ROLL
1053                                25,3543   71240 1           BMN     DLOAD
1054  REF   1                      25,3544   53624 1                   L357
1055                                25,3545   41542 1           SR1     PUSH        Y = Y/2
1056                                25,3546   75345 1  L353     DLOAD   SIGN        IF LATANG SIGN(K2ROLL)-Y POS, SWITCH
1057  REF   7  LAST  824            25,3547   03676 0                   LATANG
1058  REF   4  LAST  824            25,3550   03644 1                   K2ROLL
1059                                25,3551   77625 0           DSU
1060                                25,3552   71240 1           BMN     DLOAD
1061  REF   2  LAST  824            25,3553   53561 0                   L355
1062  REF   5  LAST  824            25,3554   03644 1                   K2ROLL
1063                                25,3555   57414 1           BONCLR  DCOMP       IF NOSWITCH =1, K2ROLL= K2ROLL
10631 REF   2  LAST  815            25,3556   03210 1                   NOSWITCH
10632 REF   3  LAST  824            25,3557   53561 0                   L355
1064  REF   6  LAST  824            25,3560   03644 1           STORE   K2ROLL      K2ROLL = - K2ROLL

1065                                25,3561   56345 0  L355     DLOAD   DDV         ROLLC = ACOS(  (L/D1) / LAD)
1066  REF   4  LAST  824            25,3562   03636 1                   L/D1
1067  REF  17  LAST  823            25,3563   03624 1                   LAD         MPAC SET TO +-1 IF OVERFLOW***
1068                                25,3564   65542 1           SR1     ACOS
1069                                25,3565   77765 0           SIGN
1070  REF   7  LAST  824            25,3566   03644 1                   K2ROLL
1071  REF  11  LAST  82C            25,3567   03316 0           STORE   ROLLC

1072                                25,3570   77776 1  ENDEXIT  EXIT

1073  REF  31  LAST  686            25,3571   3 4676 1 OVERNOUT CA      BIT13       ENTRYDSP  =92D  813
1074  REF   7  LAST  795            25,3572   7 0102 0          MASK    CM/FLAGS
1075                                25,3573   0 0006 1          EXTEND
1076  REF   1                      25,3574   1 3600 0          BZF     NODISKY     OMIT DISPLAY.

1077  REF   7  LAST  751            25,3575   3 1263 1          CA      ENTRYVN     ALL ENTRY DISPLAYS ARE DONE HERE.
```

```
1078  REF 234  LAST  780   25,3576  0 4555 C            TC      BANKCALL
1079  REF   2  LAST  529   25,3577   20621 0            CADR    REGODSPR      NO ABORT IF DISKY IN USE

1080                       25,3600  0 0004 0  NODISKY   INHINT
1081  REF   4  LAST  508   25,3601  10 067 1            CCS     NEWJCB        PROTECT READACCS GRP 5, IF SIDETRACKED.
1082  REF   3  LAST  508   25,3602  0 5057 0            TC      CHANG1
1083  REF  47  LAST  781   25,3603  0 4574 C  SERVNOUT  TC      POSTJUMP      ( COME HERE FROM P67.3)
1084  REF   5  LAST  756   25,3604   77136 0            CADR    SERVEXIT      AND END AVERAGEG JOB VIA  ENDOFJOB.
```

```
P1085           DISPLAY WHEN V IS LESS THAN VQUIT.

 1086                          25,3605   77776 1  STEEROFF EXIT
 1087  REF   4  LAST  821     25,3606   3 4753 1           CA     EBENTRY      PRECAUTIONARY.
 1088  REF  36  LAST  821     25,3607   54 003 C           TS     EBANK

 1089  REF  12  LAST  812     25,3610   3 4763 1           CA     PRIO16       2 LESS THAN NTRYPRIO.
 1090  REF  27  LAST  773     25,3611   0 5027 1           TC     NOVAC
 1091  REF  25  LAST  784     E6,1661                      EBANK= AOG          ANY EB HERE
 1092  REF   3  LAST  751     25,3612    02511 C           2CADR  P67.1        START UP REMAINDER OF P67
 1092                          25,3613    54066 C
A1093                                                                        RTOGO        LAT          LONG
A1094                                                                        XXXX.X NM    XXX.XX DEG   XXX.XX DEG

 1095  REF  28  LAST  781     25,3614   0 5261 1           TC     2PHSCHNG     INHINT/RELINT DONE.
 1096                          25,3615    00414 C           OCT    00414        4.41 RESTART FOR P67.1 DISPLAY JOB.
 1097                          25,3616    10035 C           OCT    10035        SERVICER 5.3 RESTART.

 1098  REF   1                 25,3617   3 3623 C           CA     P67.2CAD     HEREAFTER, DO LAT, LONG.
 1099  REF  14  LAST  821     25,3620   55'645 C           TS     GOTOADDR

 1100  REF 21C  LAST  822     25,3621   0 6006 1           TC     INTPRET
 1101                          25,3622    77650 1           GOTO
 1102  REF   1                 25,3623    54530 C  P67.2CAD        P67.2        CONTINUE FOR LAT, LONG THIS TIME.

 1103                          25,3624    75345 1  L357     DLOAD  SIGN         L/D = L/DCMINR SIGN(L/D)
 1104  REF   4  LAST  824     25,3625    C3630 1                  L/DCMINR
 1105  REF  13  LAST  824     25,3626    03634 C                  L/D
 1106  REF   5  LAST  824     25,3627    37636 C           STCALL L/D1
 1107  REF   4  LAST  824     25,3630    53561 C                  L355         (GO TO )
```

L REENTRY CONTROL USER'S PAGE NO. 33 E7 S3

P1108 TABLE USED FOR SUB-ORBITAL REFERENCE TRAJECTORY CONTROL.

1109	25,3631	00474 0	VREFER	DEC	.019288		REFERENCE VELOCITY SCALED V/51532.3946
1110	25,3632	01235 1		DEC	.040809		13 POINTS ARE STORED AS THE INDEPENDENT
1111	25,3633	02337 1		DEC	.076107		VARIABLE AND THEN SIX 13 POINT FUNCTIONS
1112	25,3634	03721 0		DEC	.122156		OF V ARE STORED CONSECUTIVELY
1113	25,3635	05230 0		DEC	.165546		
1114	25,3636	06213 1		DEC	.196012		
1115	25,3637	10550 0		DEC	.271945		
1116	25,3640	11717 0		DEC	.309533		
1117	25,3641	13314 0		DEC	.356222		
1118	25,3642	14736 0		DEC	.404192		
1119	25,3643	16255 1		DEC	.448067		
1120	25,3644	16457 0		DEC	.456023		
1121	25,3645	25570 1		DEC	.67918		HIGH VELOCITY FOR SAFETY
1122	25,3646	77526 0		DEC	-.010337		DRANGE/DA SCALED DRDA/(2700/805)
1123	25,3647	77360 1		DEC	-.016550		
1124	25,3650	77106 0		DEC	-.026935		
1125	25,3651	76516 1		DEC	-.042039		
1126	25,3652	76071 0		DEC	-.058974		
1127	25,3653	75570 1		DEC	-.070721		
1128	25,3654	74661 0		DEC	-.098538		
1129	25,3655	74436 0		DEC	-.107482		
1130	25,3656	73212 1		DEC	-.147762		
1131	25,3657	71640 0		DEC	-.193289		
1132	25,3660	54557 1		DEC	-.602557		
1133	25,3661	40000 0		DEC	-.99999		
1134	25,3662	40000 0		DEC	-.99999		
1135	25,3663	77635 1		DEC	-.0478599	B-3	-DRANGE/DRDOT
1136	25,3664	77563 1		DEC	-.0683663	B-3	SCALED((2VS/8 2700) DR/DRDOT)
1137	25,3665	77354 0		DEC	-.1343468	B-3	
1138	25,3666	76712 1		DEC	-.2759846	B-3	
1139	25,3667	76066 0		DEC	-.4731437	B-3	
1140	25,3670	75322 0		DEC	-.6472087	B-3	
1141	25,3671	73237 0		DEC	-1.171693	B-3	
1142	25,3672	72104 1		DEC	-1.466382	B-3	
1143	25,3673	70301 1		DEC	-1.905171	B-3	
1144	25,3674	65635 1		DEC	-2.547990	B-3	
1145	25,3675	57311 0		DEC	-4.151220	B-3	
1146	25,3676	50575 0		DEC	-5.813617	B-3	
1147	25,3677	50575 0		DEC	-5.813617	B-3	

P1148

1149	25,3700	74443 1	DEC	-.0134001	B3	RCOTREF	SCALED (8 RDT/2VS)	
1150	25,3701	74333 1	DEC	-.013947	B3			
1151	25,3702	74433 0	DEC	-.013462	B3			
1152	25,3703	74763 0	DEC	-.011813	B3			
1153	25,3704	75432 0	DEC	-.0095631	B3			
1154	25,3705	75735 1	DEC	-.00806946	B3			
1155	25,3706	76200 1	DEC	-.006828	B3			
1156	25,3707	75735 1	DEC	-.00806946	B3			
1157	25,3710	75140 0	DEC	-.0109791	B3			
1158	25,3711	74075 0	DEC	-.0131496	B3			
1159	25,3712	73312 0	DEC	-.0179817	B3			
1160	25,3713	73732 0	DEC	-.0159061	B3			
1161	25,3714	73732 0	DEC	-.0159061	B3			
1162	25,3715	00015 0	DEC	.0008067			RANGE TO GO SCALED RTOGO/2700	
1163	25,3716	00066 1	DEC	.0032963			8.9	
1164	25,3717	00206 0	DEC	.0081852			22.1	
1165	25,3720	00431 1	DEC	.017148				
1166	25,3721	00712 0	DEC	.027926				
1167	25,3722	01136 1	DEC	.037				
1168	25,3723	02015 1	DEC	.063296				
1169	25,3724	02374 0	DEC	.077889				
1170	25,3725	03123 1	DEC	.098815				
1171	25,3726	04051 1	DEC	.127519				
1172	25,3727	05767 1	DEC	.186963				
1173	25,3730	07476 0	DEC	.238148				
1174	25,3731	11324 1	DEC	.294185185				
1175	25,3732	76272 1	DEC	-.051099			-AREF/805	
1176	25,3733	75472 1	DEC	-.074534				
1177	25,3734	74604 0	DEC	-.101242				
1178	25,3735	74210 1	DEC	-.116646				
1179	25,3736	74052 0	DEC	-.122360				
1180	25,3737	73735 1	DEC	-.127081				
1181	25,3740	73217 1	DEC	-.147453				
1182	25,3741	73013 1	DEC	-.155528				
1183	25,3742	73155 1	DEC	-.149565				
1184	25,3743	74151 1	DEC	-.118509				
1185	25,3744	76703 1	DEC	-.034907				
1186	25,3745	77575 0	DEC	-.007950				
1187	25,3746	77575 0	DEC	-.007950				

P1188

1189	25,3747	00112 0	DEC	.004491	DRANGE/D L/D SCALED Y/2700
1190	25,3750	00204 1	DEC	.008081	
1191	25,3751	00407 1	DEC	.016030	
1192	25,3752	01113 0	DEC	.035815	
1193	25,3753	02161 0	DEC	.069422	
1194	25,3754	03260 0	DEC	.104519	
1195	25,3755	03717 0	DEC	.122	
1196	25,3756	05411 0	DEC	.172407	
1197	25,3757	10057 1	DEC	.252852	
1198	25,3760	13476 0	DEC	.363148	
1199	25,3761	20324 0	DEC	.512963	
1200	25,3762	21677 1	DEC	.558519	
1201	25,3763	21677 1	DEC	.558519	END OF STORED REFERENCE

```
L       REENTRY CONTROL

P1202   REENTRY CONSTANTS.

R1203   DEFINED BY EQUALS

 1204   REF  1                  4721            DEC15   =       LOW4
A1205                                           GAMMAL1 =       22D

 12055                  25,3764  16631 1 MAXRNG  2OCT    16631 06755     DNRNGERR = 9999.9 IF GONEPAST=1
 12055                  25,3765  06755 0

 1206                   26,3144                 BANK    26
 1207   REF  2 LAST 802 26,2000                 SETLOC  REENTRY1
 1208                   26,3144                 BANK

 1209   REF  2 LAST 802 TO 804:    41    41*    COUNT*  $$/ENTRY

 1210   REF  3 LAST 812 27,3333         BARELY1 =       NEARONE         COMMON TO BOTH DISK,DANCE.DEFND IN TFF
A1211                                   1BITDP                  COMMON TO BOTH DISK AND DANCE. DEFND IN VECPOINT.

 1212                   26,3144  02525 1 1/12TH  DEC     .083333         DP 1/12 USES HI WORD IN 1/3 BELOW
 1213                   26,3145  12525 0 1/3RD   2DEC    .3333333333     DP 1/3
 1213                   26,3146  12525 0
R1214
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R1215   BELOW: VS  =  VSAT  = 25766.1973  FT/SEC

R1216          RE  =  21,202,900   FEET

 1217                   26,3147  04631 1 LEWD1   2DEC    .15
 1217                   26,3150  23146 0
 1218                   26,3151  03146 1 POINT1  2DEC    .1
 1218                   26,3152  14632 0
 1219                   26,3153  06314 1 POINT2  2DEC    .2              .2
 1219                   26,3154  31463 1
 1220                   26,3155  76314 0 DLEWDO  2DEC    - .05           -.05
 1220                   26,3156  71462 1
 1221                   26,3157  05075 0 GMAX/2  2DEC    .16             8 GS / 2
 1221                   26,3160  16051 1
 1222   REF 23 LAST 76C 26,3331         3ZEROS  EQUALS HI6ZEROS
 1223                   26,3161  07777 1 NEAR1/4 2OCT    07777 00000     1/4 LESS 1 BIT IN UPPER PART.
 1223                   26,3162  00000 1
 1224                   26,3163  00236 0 C18     2DEC    .0097026346     500/2VS
 1224                   26,3164  36763 0
 1225                   26,3165  00204 1 Q7FKDMIN 2DEC   .0080745342     6.5/805  (Q7F +KDMIN) = 6 + .5)
 1225                   26,3166  11303 1
 1226   REF  2 LAST 76C 27,3327         C1/16   =       DP2(-4)

 1227                   26,3167  05260 0 Q3      2DEC    .167003132      .07 2VS/21600
 1227                   26,3170  05572 1
 1228                   26,3171  12343 0 Q5      2DEC    .326388889      .3 23500/21600
 1228                   26,3172  21616 0
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1229                    26,3173  01073 1  Q6       2DEC    .0349            2 DEG, APPROX 820/23500
1229                    26,3174  31515 1
1230                    26,3175  00172 0  Q7F      2DEC    .0074534161       6/805    (VALUE OF Q7 IN FIXED MEM.)
1230                    26,3176  03571 1
1231  REF  6 LAST 813   26,3327           Q19      =       HALVE            Q19 = .5

1232                    26,3177  00573 0  Q21      2DEC    .0231481481      500/21600
1232                    26,3200  10230 1
1233                    26,3201  76226 0  Q22      2DEC    -.053333333      -1152/21600
1233                    26,3202  45761 0
1234                    26,3203  13132 0  VLMIN    2DEC    .34929485        18000/2 VS
1234                    26,3204  33062 0
1235  REF  2 LAST 799   26,3321           VMIN     =       FOURTH           (VS/2) / 2VS
1236                    26,3205  00160 0  C12      2DEC    .00684572901     32 28500/(21202900 2 PI)
1236                    26,3206  05104 1
1237                    26,3207  11322 1  1/K81    2DEC    .29411765        1 / 3.4
1237                    26,3210  32265 1
1238                    26,3211  75047 0  -1/K82    2DEC    -.0057074322 B4  = -1/(  .0034  2  VS)   EXP +4
1238                    26,3212  72454 1
1239                    26,3213  00475 1  VQUIT    2DEC    .019405269       1000 /2VS
1239                    26,3214  35746 1
1240                    26,3215  06751 1  C20      2DEC    .21739130         (175 FPSS) LIFT UP IF ABOVE C20
1240                    26,3216  27515 0
12405                   26,3217  05441 0  C21      2DEC    .17391304        140/805
12405                   26,3220  14412 0
1241                    26,3221  00022 1  25NM     2DEC    .0011574074      25/21600          (25 NAUT MILES)
1241                    26,3222  36641 1
1242                    26,3223  01003 0  K1D      2DEC    .0314453125      =C16 805/256 = .01 805/256
1242                    26,3224  06315 0
1243                    26,3225  71435 0  K2D      2DEC    -.201298418      -C17 2VS/256 = -.001 2VS/256
1243                    26,3226  75516 1
1244                    26,3227  32047 0  KVSCALE  2DEC    .81491944         12800/(2 VS .3048)
1244                    26,3230  24367 0
1245                    26,3231  37200 1  KASCALE  2DEC    .97657358         5.85 16384/(4 .3048 100 805)
1245                    26,3232  05636 1
1246                    26,3233  00046 0  KTETA    2DEC*   .383495203 E2 B-14*          1000 2PI/16384(163.84)
1246                    26,3234  13137 0
1247                    26,3235  00017 1  KT1      2DEC*   .157788327 E 2 B-14*      RE(2PI)/2 VS(16384) 163.84
1247                    26,3236  30730 0
1248                    26,3237  00040 0  .05G     2DEC    .002              .05/25
1248                    26,3240  30447 0
1249                    26,3241  00000 1  LATBIAS  2DEC    .00003            APPRX .5 NM/ 4(21600/2 PI)
1249                    26,3242  17565 1
1250                    26,3243  01727 1  KWE      2DEC    .120056652 B-1
1250                    26,3244  20103 1
1251                    26,3245  00121 0  KACOS    2DEC    .004973592        1/32(2PI)
1251                    26,3246  17460 0
1252                    26,3247  01000 0  CHOCK    2DEC    1 B-5             .25/8
1252                    26,3250  00000 1
1253                    26,3251  04000 0  1/8TH    2DEC    .125
1253                    26,3252  00000 1
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1254                          26,3253   12172 0  CH1       2DEC   .32              8 CH1/25 = 8 (1) /25
1254                          26,3254   34122 1
1255                          26,3255   77152 1  KC3       2DEC   -.0247622232     -(4 VS VS/ 2 PI 805 RE)
1255                          26,3256   51394 1
1256                          26,3257   00336 1  VRCONT    2DEC   .0135836886      700/2 VSAT
1256                          26,3260   21610 0
1257  REF  10 LAST  766       26,3327            HALVE     EQUALS HIDPHALF
1258  REF   2 LAST  767       26,3321            FOURTH    EQUALS HIDP1/4

1259  REF   7 LAST  831       26,3327            1/GMAX    EQUALS HALVE           4/GMAX = 4 / 8
1260                          26,3261   00433 0  2HS       2DEC   .0172786611      2 28500 25 32.2/(4 VS VS)
1260                          26,3262   02775 0
1261                          26,3263   00000 1  2HSGMXSQ  2DEC   .0000305717     (2 28500 8 32.2/ 4 VS VS)SQ
1261                          26,3264   20017 0
1262                          26,3265   77765 0  C001      2DEC   -.000625        -(4/25)/256    LEQ/DO CONST
1262                          26,3266   70243 0
1263                          26,3267   31463 1  POINT8    2DEC   .8
1263                          26,3270   06315 0
1264                          26,3271   00541 1  2C1HS     2DEC   .0215983264      2 1.25 28500 805/(2 VS)SQ
1264                          26,3272   33575 0
1265                          26,3273   00146 1  PT1/16    2DEC   .1 B-4
1265                          26,3274   14632 0
1266                          26,3275   00052 0  1/K44     2DEC   .00260929464    2 VS/19749550
1266                          26,3276   30013 0
1267                          26,3277   20411 1  VFINAL    2DEC   .51618016       26600/2 VS
1267                          26,3300   03041 1
1268                          26,3301   20610 1  VFINAL1   2DEC   .523942273      = 27000 / 2 VS
1268                          26,3302   10513 1
1269                          26,3303   11473 1  1/KA1     2DEC   .30048077       25/(1.3 64)
1269                          26,3304   02355 0
1270                          26,3305   00203 0  KA2       2DEC   .008            .2 / 25
1270                          26,3306   02234 0
1271                          26,3307   16237 0  KA3       2DEC   .44720497       = 90  4/805
1271                          26,3310   00146 1
1272                          26,3311   01456 1  KA4       2DEC   .049689441      40/805
1272                          26,3312   03450 0
1273  REF   2 LAST  804       26,3311            Q7MIN     =      KA4             = 40/805 = .049689441
1274                          26,3313   56232 1  -HSCALED  2DEC   -.55305018      -28500/2 VS
1274                          26,3314   72332 0
1275                          26,3315   77000 1  -KSCALE   2DEC   -.0312424837    -805/VS
1275                          26,3316   43741 1
1276                          26,3317   36702 1  COS15     2DEC   .965
1276                          26,3320   21727 0
1277  REF   2 LAST  813       26,3144            LATSLOPE  EQUALS 1/12TH
R1278       ... END OF RE-ENTRY CONSTANTS ...
```

L CM BODY ATTITUDE USER'S PAGE NO. 1 EO S3

P0001

```
0010                        35,3755                     BANK   35

0011  REF   1               37,2000                     SETLOC BODYATT
0012                        37,3375                     BANK

0013  REF   1                                           COUNT  37/CMBAT

A0014                                                   PDL 120 - 150 SAFE.

R0015    VALUES OF GIMBAL AND BODY ANGLES VALID AT PIP TIME ARE SAVED DURING    READACCS.

0017  REF  10 LAST  799    E7,1451                     EBANK= RTINIT          LET INTERPRETER SET EB

0018  REF 211 LAST  826    37,3375  0 6006 1 CM/POSE   TC     INTPRET         COME HERE VIA AVEGEXIT.

0019                        37,3376  77201 1            SETPD  VLOAD
0020                        37,3377  00001 0                   0
0021  REF  16 LAST  799     37,3400  01177 1                   VN             KVSCALE = (12800/ .3048) /2VS
0022                        37,3401  63361 0            VXSC   PDVL
0023  REF   1               37,3402  37674 0                   -KVSCALE       KVSCALE = .81491944
0024  REF  10 LAST  786     37,3403  01714 1                   UNITW          FULL UNIT VECTOR
0025                        37,3404  74235 0            VXV    VXSC            VREL = V - WE*R
0026  REF  10 LAST  800     37,3405  01760 1                   UNITR
0027  REF   1               37,3406  15244 1                   KWE
0028                        37,3407  45455 1            VAD    STADR
0029  REF   3 LAST  799     37,3410  74251 1            STORE  -VREL           SAVE FOR ENTRY GUIDANCE.  REF COORDS

0030                        37,3411  72056 1            UNIT   LXA,1
0031                        37,3412  00044 1                   36D            ABVAL( -VREL) TO X1
0032  REF   6 LAST  801     37,3413  03542 1            STORE  UXA/2           -UVREL                    REF COORDS

0033                        37,3414  57435 1            VXV    VCOMP
0034  REF  11 LAST  833     37,3415  01760 1                   UNITR          .5 UNIT                   REF COORDS
0035                        37,3416  66256 0            UNIT   SSP            THE FOLLOWING IS TO PROVIDE A STABLE
0036  REF  32 LAST  738     37,3417  00051 0                   S1             UN FOR THE END OF THE TERMINAL PHASE.
0037                        37,3420  00476 1 SPVQUIT    DEC    .019405        1000/ 2 VS
0038                        37,3421  77300 1            TIX,1  VLOAD          IF V-VQUIT POS, BRANCH.
0039  REF   1               37,3422  77424 0                   CM/POSE2       SAVE UYA IN OLDUYA
0040  REF   2 LAST  115     37,3423  03534 0                   OLDUYA         OTHERWISE CONTINUE TO USE OLDUYA.
0041  REF   3 LAST  769     37,3424  03550 1 CM/POSE2   STORE  UYA/2                                     REF COORDS

0042  REF   3 LAST  833     37,3425  03534 0            STORE  OLDUYA          RESTORE, OR SAVE AS CASE MAY BE.

0043                        37,3426  57435 1            VXV    VCOMP
0044  REF   7 LAST  833     37,3427  03542 1                   UXA/2          FINISH OBTAINING TRAJECTORY TRIAD.
0045                        37,3430  77772 0            VSL1
0046  REF   3 LAST  769     37,3431  03556 1            STORE  UZA/2                                     REF COORDS
```

L CM BODY ATTITUDE USER'S PAGE NO. 2 E7 S3

```
0047                        37,3432  77751 1          TLOAD                PICK UP CDUX, CDUY, CDUZ CORRESPONDING
0048  REF  3 LAST 775       37,3433  03270 1                   ADG/PIP     TO PIPUP TIME IN 2S,C  AND SAVE.
0049                        37,3434  14031 C  CM/TRIO STODL   24D
0050                        37,3435  00032 C                   25D         AIG/PIP

0051                        37,3436  41434 1          RTB      PUSH        TO PDLO
0052  REF  7 LAST 445       37,3437  45510 1                   CDULCGIC
0053                        37,3440  77746 1          COS
0054  REF  2 LAST 115       37,3441  17564 C          STODL    UBX/2       CI /2
A0055                                                                     AIG/PIP FROM PDL 0
0056                        37,3442  57556 C          SIN      DCOMP
0057  REF  3 LAST 834       37,3443  17570 0          STODL    UBX/2 +4    -SI /2
0058                        37,3444  00033 1                   26D         AMG/PIP
0059                        37,3445  41434 1          RTB      PUSH        TO PDL 0
0060  REF  8 LAST 834       37,3446  45510 1                   CDULCGIC
0061                        37,3447  65356 1          SIN      PDDL        XCH PDL 0. SAVE SM /2
0062                        37,3450  65346 C          COS      PDDL        CM /2 TO PDL 2
0063                        37,3451  00001 C                   0           SM /2
0064                        37,3452  74276 1          DCOMP    VXSC
0065  REF  4 LAST 834       37,3453  03564 C                   UBX/2
0066                        37,3454  77772 C          VSL1                 NOISE WONT OVFL.
0067  REF  2 LAST 115       37,3455  17572 1          STODL    UBY/2       =(-SMCI, NOISE, SMSI) /2
0068                        37,3456  00003 1                   2           CM /2  REPLACES NOISE
0069  REF  3 LAST 834       37,3457  17574 1          STODL    UBY/2 +2    UBY/2=(-SMCI, CM, SMSI)/2
0070                        37,3460  00031 0                   24D         AOG/PIP
0071                        37,3461  41434 1          RTB      PUSH        TO PDL 4
0072  REF  9 LAST 834       37,3462  45510 1                   CDULCGIC
0073                        37,3463  65356 1          SIN      PDDL        XCH PDL 4. SAVE SO /2
0074                        37,3464  74346 C          COS      VXSC        CO /2
0075  REF  4 LAST 834       37,3465  03572 1                   UBY/2
0076  REF  5 LAST 834       37,3466  17572 1          STODL    UBY/2       UBY/2=(-COSMCI, COCM, COSMSI)/4
0077                        37,3467  00005 1                   4D          SO /2
0078                        37,3470  57405 1          DMP      DCOMP
0079  REF  5 LAST 834       37,3471  03570 C                   UBX/2 +4    -SI /2
0080                        37,3472  77615 C          DAD
0081  REF  6 LAST 834       37,3473  03572 1                   UBY/2        INCREMENT BY (SOSI /4)
0082  REF  7 LAST 834       37,3474  17572 1          STODL    UBY/2
A0083                                                                     SO /2 FROM PDL 4
0084                        37,3475  43205 1          DMP      DAD
0085  REF  6 LAST 834       37,3476  03564 C                   UBX/2       CI /2
0086  REF  8 LAST 834       37,3477  03576 C                   UBY/2 +4
0087  REF  9 LAST 834       37,3500  27576 C          STOVL    UBY/2 +4    YB/4                 PLATFORM COORDS

A0088                                                     YB = (-COSMCI + SOSI , COCM , COSMSI + SOCI )

0089  REF 10 LAST 834       37,3501  03572 1                   UBY/2
0090                        37,3502  72505 1          VXM      VSL2
0091  REF 33 LAST 787       37,3503  01736 1                   REFSMMAT    .5 UNIT
0092  REF 11 LAST 834       37,3504  17572 1          STODL    UBY/2       YB/2  DONE                 REF COORDS
```

L CM BODY ATTITUDE

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A0093                                                          CM /2 FROM PDL 2
 0094                          37,3505  76561 1    VXSC   VSL1
 0095  REF   7  LAST  834      37,3506  03564 0           UBX/2
 0096  REF   8  LAST  835      37,3507  17564 0    STODL  UBX/2          =( CMCI, NOISE, -CMSI)/2
 0097                          37,3510  77626 0    STADR                 SM /2 FROM PDL 0
 0098  REF   9  LAST  835      37,3511  50211 0    STOVL  UBX/2 +2       SM /2 REPLACES NOISE
 0099  REF  10  LAST  835      37,3512  03564 0           UBX/2          XB/2              PLATFORM COORDS

A0100                                                          XB = ( CMCI , SM , -CMSI )

 0101                          37,3513  76505 0    VXM    VSL1
 0102  REF  34  LAST  834      37,3514  01736 1           REFSMMAT       .5 UNIT
 0103  REF  11  LAST  835      37,3515  03564 0    STORE  UBX/2          XB/2  DONE        REF COORDS

 0104                          37,3516  76435 1    VXV    VSL1
 0105  REF  12  LAST  834      37,3517  03572 1           UBY/2
 0106  REF   2  LAST  115      37,3520  27600 1    STOVL  UBZ/2          ZB/2  DONE        REF COORDS

A0107                                                          EQUIVALENT TO
A0108                                                          ZB = ( SOSMCI + COSI , -SOCM , -SOSMSI + COCI)

 0109  REF   8  LAST  833      37,3521  03542 1           UXA/2          -UVREL/2 = -UVA/2
 0110                          37,3522  53435 0    VXV    UNIT           GET UNIT(-UVREL*UBY)/2  = UL/2
 0111  REF  13  LAST  835      37,3523  03572 1           UBY/2          YB/2
 0112                          37,3524  50206 0    PUSH   DOT            UL/2  TO PDL 0,5
 0113  REF   4  LAST  833      37,3525  03556 1           UZA/2          UNA/2
 0114  REF   3  LAST  542      37,3526  24021 1    STOVL  COSTH          COS(ROLL)/4
 0115                          37,3527  00001 0           0              UL/2

 0116                          37,3530  77641 1    DOT
 0117  REF   4  LAST  833      37,3531  03550 1           UYA/2
 0118  REF   3  LAST  542      37,3532  34023 1    STCALL SINTH          -SIN(ROLL)/4
 0119  REF   3  LAST  542      37,3533  47211 0           ARCTRIG
 0120                          37,3534  24007 0    STOVL  6D             -(ROLL/180) /2
 0121  REF  14  LAST  835      37,3535  03572 1           UBY/2
 0122                          37,3536  72441 0    DOT    SL1            -UVA.UBY = -SIN(BETA)
 0123  REF   9  LAST  835      37,3537  03542 1           UXA/2          -UVREL/2
 0124                          37,3540  77736 0    ARCSIN
 0125                          37,3541  24010 0    STOVL  7D             -(BETA/180) /2
 0126  REF  12  LAST  835      37,3542  03564 0           UBX/2          XB/2
 0127                          37,3543  77641 1    DOT                   UL.UBX = -SIN(ALFA)
 0128                          37,3544  00001 0           0              UL/2
 0129  REF   4  LAST  835      37,3545  24023 0    STOVL  SINTH          -SIN(ALFA)/4
 0130                          37,3546  77641 1    DOT                   UL/2 FROM PDL 0
 0131  REF   3  LAST  835      37,3547  03600 1           UBZ/2
 0132  REF   4  LAST  835      37,3550  34021 0    STCALL COSTH          COS(ALFA)/4
 0133  REF   4  LAST  835      37,3551  47211 0           ARCTRIG
 0134                          37,3552  24011 1    STOVL  8D             -(ALFA/180) /2
 0135  REF  12  LAST  833      37,3553  01760 1           UNITR          UR/2              REF COORDS
 0136                          37,3554  72441 0    DOT    SL1
```

L CM BODY ATTITUDE

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0137   REF   5 LAST  835   37,3555   03556 1              UZA/2        MORE ACCURATE AT LARGE ARG.
0138                       37,3556   77726 1    ARCCOS
0139                       37,3557   00013 0    STORE  10D           (-GAMA/180)/2

0140                       37,3560   77551 0    TLOAD  EXIT          ANGLES IN MPAC IN THE ORDER
A0141                                                                -( (ROLL, BETA, ALFA) /180)/2
0142                       37,3561   00007 0                 6D      THESE VALUES CORRECT AT PIPUP TIME.
R0143  SPACER
```

P0144 BASIC SUBROUTINE TO UPDATE ATTITUDE ANGLES

```
 0145   REF  26  LAST  826   E6,1661                          EBANK= AOG

 0146   REF   1               37,3562  3 4752 C  CM/ATUP  CA     EBACC
 0147   REF  37  LAST  826    37,3563  54 003 C           TS     EBANK
 0148   REF  17  LAST  734    37,3564  50 120 1  CMTR1     INDEX  FIXLOC
 0149                         37,3565  4 0012 C           CS     10D        (GAMA/180)/2
 0150   REF   2  LAST  109    37,3566  57'722 1           XCH    GAMA
 0151   REF  75  LAST  776    37,3567  54 001 1           TS     L

 0152                         37,3570  0 0004 C           INHINT
A0153                                                    MUST REMAIN INHINTED UNTIL UPDATE OF BODY
A0154                                                    ANGLES, SO THAT GAMDIFSW IS VALID FIRST PASS
A0155                                                    INDICATOR.

 0156   REF   8  LAST  824    37,3571  4 0102 C           CS     CM/FLAGS
 0157   REF  23  LAST  729    37,3572  7 4700 C           MASK   BIT11      GAMDIFSW=940 BIT11   INITLY=0
 0158                         37,3573  0 0006 1           EXTEND            DONT CALC GAMA DOT UNTIL HAVE FORMD
A0159                                                                      ONE DIFFERENCE.
 0160   REF   1               37,3574  1 3577 C           BZF    DOGAMDOT   IS OK, GO ON.
 0161   REF   9  LAST  837    37,3575  26 102 C           ADS    CM/FLAGS   KNOW BIT IS 0
 0162   REF   1               37,3576  0 3612 1           TC     NOGAMDOT   SET GAMDOT = 0

 0163   REF  76  LAST  837    37,3577  4 0001 1  DOGAMDOT CS     L
 0164   REF   3  LAST  837    37,3600  6 1722 1           AD     GAMA       DEL GAMA/360= T GAMDOT/360
 0165                         37,3601  0 0006 1           EXTEND
 0166   REF   1               37,3602  7 3675 1           MP     TCDU       TCDU = .1 SEC,   T = 2 SEC.
 0167   REF   2  LAST  109    37,3603  55'723 1           TS     GAMDOT     GAMA DOT TCDU / 180

 0168                         37,3604  0 0006 1           EXTEND            IGNORE GAMDOT IF LEQ  .5 DEG/SEC
 0169                         37,3605  6 3607 C           BZMF   +2
 0170                         37,3606  4 0000 C           COM
 0171   REF  19  LAST  821    37,3607  6 4715 C           AD     FIVE
 0172                         37,3610  0 0006 1           EXTEND
 0173                         37,3611  6 3614 1           BZMF   +3         SET GAMDOT=+0 AS TAG IF TOO SMALL.

 0174   REF 152  LAST  785    37,3612  3 4714 1  NOGAMDOT CA     ZERO       COME HERE INHINTED.
 0175   REF   3  LAST  837    37,3613  55'723 1           TS     GAMDOT
A0176                                                    FOR NOW LEAVE IN 25,C
A0177                                                    UPDATE ANGLES BY CORRECTING EUILER ANG
A0178                                                    FOR ACCRUED INCREMENT SINCE PIPUP
A0179                                                    R = R EUIL + R(NOW) -R(PIPUP)
 0180   REF 284  LAST  822    37,3614  4 0154 C           CS     MPAC       GET (R EUL/180) /2
 0181                         37,3615  6 0000 1           DOUBLE            POSSIBLE OVERFLOW
 0182   REF   1               37,3616  0 3665 1           TC     CORANGOV   CORRECT FOR OVFL IF ANY
 0183                         37,3617  0 0006 1           EXTEND
 0184   REF   3  LAST  775    37,3620  61'672 C           SU     ROLL/PIP   GET INCR SINCE PIPUP
 0185   REF   3  LAST  775    37,3621  6 1664 1           AD     ROLL/180   ONLY SINGLE OVFL POSSIBLE.
 0186   REF   2  LAST  837    37,3622  0 3665 1           TC     CORANGOV   CORRECT FOR OVFL IF ANY
```

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0187   REF   2  LAST  113   37,3623  55'770 1          TS      TEMPROLL

0188   REF 285  LAST  837   37,3624  4 0156 1          CS      MPAC +2        GET (ALFA EUL/180) /2
0189                        37,3625  6 0000 1          DOUBLE                 SAME AS FOR ROLL. NEEDED FOR EXT ATM DAP
0190   REF   3  LAST  837   37,3626  0 3665 1          TC      CORANGOV       CORRECT FOR OVFL IF ANY
0191                        37,3627  0 0006 1          EXTEND
0192   REF   2  LAST  108   37,3630  61'673 1          SU      ALFA/PIP
0193   REF   3  LAST  172   37,3631  6 1665 0          AD      ALFA/180
0194   REF   4  LAST  838   37,3632  0 3665 1          TC      CORANGOV       CORRECT FOR OVFL IF ANY
0195   REF   2  LAST  113   37,3633  55'771 0          TS      TEMPALFA

0196   REF 286  LAST  838   37,3634  4 0155 1          CS      MPAC +1        GET (BETA EUL/180) /2
0197                        37,3635  6 0000 1  CMTR2   DOUBLE
0198                        37,3636  0 0006 1          EXTEND
0199   REF   3  LAST  775   37,3637  61'674 0          SU      BETA/PIP
0200   REF   3  LAST  775   37,3640  6 1666 0          AD      BETA/180
0201   REF   2  LAST  113   37,3641  57'772 1          XCH     TEMPBETA       OVFL NOT EXPECTED.

0202   REF   3  LAST  524   37,3642  3 4744 1          CA      EBANK3
0203   REF  38  LAST  837   37,3643  54 003 0          TS      EBANK

0204   REF   1               E3,1446                   EBANK=  PHSNAMES
0205                        37,3644  0 0006 1          EXTEND
0206   REF   1               37,3645  3 3677 1          DCA     REPOSADR       THIS ASSUMES THAT THE   TC   PHASCHNG
0207   REF   2  LAST  838   37,3646  53'447 0          DXCH    PHSNAMES       IS NOT CHANGED IN       OCT  10035
A0208                                                                         SERVICER.

0209   REF   2  LAST  837   37,3647  3 4752 0          CA      EBAOG
0210   REF  39  LAST  838   37,3650  54 003 0          TS      EBANK

0211   REF  27  LAST  837   E6,1661                   EBANK=  AOG
0212                        37,3651  0 0006 1  REDOPOSE EXTEND                 RE-STARTS COME HERE
0213   REF   3  LAST  838   37,3652  3 1771 1          DCA     TEMPROLL
0214   REF   4  LAST  837   37,3653  53'665 1          DXCH    ROLL/180
0215   REF   3  LAST  838   37,3654  3 1772 1          CA      TEMPBETA
0216   REF   4  LAST  838   37,3655  55'666 1          TS      BETA/180

0217                        37,3656  0 0003 1          RELINT

0218   REF 212  LAST  833   37,3657  0 6006 1          TC      INTPRET        CANT TC DANZIG AFTER PHASCHNG.
0219                        37,3660   51575 1  CM/POSE3 VLOAD   ABVAL          RETURN FROM CM/ATUP.  (RESTART)
0220   REF  17  LAST  833   37,3661   01177 1          VN      2(-7)  M/CS
0221   REF   6  LAST  534   37,3662   03723 1          STORE   VMAGI          FOR DISPLAY ON CALL.

0222                        37,3663   77650 1          GOTO
0223   REF   5  LAST  796   37,3664   03324 1                  POSEXIT        ENDEXIT, STARTENT, OR SCALEPOP.

0224   REF  77  LAST  837   37,3665  54 001 1  CORANGOV TS      L
0225   REF 176  LAST  785   37,3666  0 0002 0          TC      Q
0226   REF 184  LAST  822   37,3667  50 000 1          INDEX   A
```

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0227   REF   1              37,3670  3 4673 1          CA      LIMITS
0228   REF   78  LAST  838  37,3671  26 001 1          ADS     L
0229   REF  177  LAST  838  37,3672  0 0002 0          TC      Q              COSTS 2 MCT TO USE. SEE ANGOVCOR.

0230                        37,3673   45730 1 -KVSCALE 2DEC    -.81491944     -12800/(2 VS .30481)
0230                        37,3674   53410 1
0231                        37,3675   03146 1 TCDU     DEC     .1             TCDU = .1 SEC.

0232   REF   28  LAST  838  E6,1661                   EBANK=  AOG
0233   REF   1              37,3676   03651 0 REPOSADR 2CADR  REDOPOSE
0233   REF   1              37,3677   76066 0
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L P37,P70 USER'S PAGE NO. 1 EO S3

```
 0001                          31,3215          BANK   31
 00012  REF   1                36,2000          SETLOC RTE1
 00014                         36,2502          BANK

 0002   REF   3  LAST  273     E7,1631          EBANK= RTEDVD
 0003   REF   1                                 COUNT  31/P37

R0050   PROGRAM DESCRIPTION - P37, RETURN TO EARTH

R0051   DESCRIPTION
R0052     A RETURN TO EARTH TRAJECTORY IS COMPUTED PROVIDED THE CSM IS OUTSIDE THE LUNAR SPHERE OF INFLUENCE AT THE
R0054   TIME OF IGNITION. INITIALLY A CONIC TRAJECTORY IS DETERMINED AND RESULTING IGNITION AND REENTRY PARAMETERS ARE
R0056   DISPLAYED TO THE ASTRONAUT. THEN IF THE ASTRONAUT SO DESIRES, A PRECISION TRAJECTORY IS DETERMINED WITH THE
R0058   RESULTING IGNITION AND REENTRY PARAMETERS DISPLAYED. UPON FINAL ACCEPTANCE BY THE ASTRONAUT, THE PROGRAM
R0060   COMPUTES AND STORES THE TARGET PARAMETERS FOR RETURN TO EARTH FOR USE BYSPS PROGRAM (P40) OR RCS PROGRAM (P41).

R0080   CALLING SEQUENCE
R0081     L      TC     P37

R0100   SUBROUTINES CALLED
R0101     PREC100
R0102       V37100
R0103       RTENCK2
R0104       RTENCK3
R0105       TIMERAD
R0106       PARAM
R0107     V2T1CC
R0108       GAMCV1C
R0109       X11LIM
R0110       DVCALC
R0111     RTENCK1
R0112       INTSTALL
R0113       INTEGRVS
R0114     RTEVN
R0115       RTECISP
R0116       TMRAD1CC
R0117       ALGEKUGL
R0118       LAT-LONG
R0119     TMRAD1CC
R0120       TIMERAD
R0121     INVC100
R0122       CSMPREC
R0123     GETERAD
R01235    TIMETHET
R0124     P37CALRM
R0125     VN1645
R0126     FCLY

R0150   ERASABLE INITIALIZATION REQUIRED
R0151     CSM STATE VECTOR
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R0152    NJETSFLG     NUMBER OF JETS IF THE RCS PROPULSION SYSTEM SELECTED   STATE FLAG     0=4 JETS  1=2 JETS

R0160  ASTECNALT INPUT
R0161    SPRTETIG     TIME OF IGNITION (OVERLAYS TIG)                        DP      B28    CS
R0163    VPREC        DESIRED CHANGE IN VELOCITY AT TIG(PROGRM COMPUTED IF 0) DP      B7     METERS/CS
R0165    GAMMAEI      DESIRED FLIGHT PATH ANGLE AT REENTRY (COMPUTED IF 0)   DP      B0     REVS  + ABOVE HORIZ.
R0167    OPTION2      PROPULSION SYSTEM OPTION                               SP      B14    1=SPS, 2=RCS

R0180  OUTPUT
R0181    CONIC OR PRECISION TRAJECTORY DISPLAY
R0182      VPREC      VELOCITY MAGNITUDE AT 400,000 FT. ENTRY ALTITUDE       DP      B7     METERS/CS
R0184      T3TO14     TRANSIT TIME TO 400,000 FT. ENTRY ALTITUDE             DP      B28    CS
R0186      GAMMAEI    FLIGHT PATH ANGLE AT 400,000 FT. ENTRY ALTITUDE        DP      B0     REVS  + ABOVE HORIZON
R0188      DELVLVC    INITIAL VELOCITY CHANGE VECTOR IN LOCAL VERTICAL COORD. VECTOR  B7     METERS/CS
R0190      LAT(SPL)   LATITUDE OF THE LANDING SITE                           DP      B0     REVS
R0192      LNG(SPL)   LONGITUDE OF THE LANDING SITE                          DP      B0     REVS
R0194    TARGETING COMPUTATION DISPLAY
R0195      TIG        RECOMPUTED TIG BASED ON THRUST OPTION                  DP      B28    CS
R0197      TTOGO      TIME FROM TIG                                          DP      B28    CS
R0199      +MGA       POSITIVE MIDDLE GIMBAL ANGLE                           DP      B0     REVS  -.02 IF REFSMFLG=0
R0201    THRUST PROGRAM COMMUNICATION
R0202      XDELVFLG   EXTERNAL DELTA V FLAG                                  STATE FLAG     SET 0 FOR LAMBERT AIMPT
R0204      NORMSW     LAMBERT AIMPT ROTATION SWITCH                          STATE FLAG     SET 0 FOR NO ROTATION
R0206      ECSTEER    CROSS PRODUCT STEERING CONSTANT                        SP      B2     SET 1
R0208      RTARG      CONICALLY INTEGRATED REENTRY POSITION VECTOR           VECTOR  B29    METERS
R0210      TPASS4     REENTRY TIME                                           DP      B28    CS

0243   REF  88  LAST  812   36,2502  0 5301 0  P37      TC      PHASCHNG    P37 IS NOT RESTARTABLE.
0244                        36,2503   00004 0            OCT     4

0245   REF 213  LAST  838   36,2504  0 6006 1            TC      INTPRET
0246                        36,2505   66170 1            AXT,1   SXA,1
0247                        36,2506   04000 0            OCT     04000
0248   REF   5  LAST  637   36,2507   03424 0            TC      ECSTEER
0249                        36,2510   77776 1            EXIT
0250   REF   1              36,2511  3 3242 0            CAF     V6N33RTE    INPUT TIG   STORED IN SPRTETIG
0251   REF   1              36,2512  0 3231 1            TCR     P37OGOF                 OVERLAYED WITH TIG
0252                        36,2513  1 2511 1            TCF     -2          DESPLAY NEW DATA
0253   REF   1              36,2514  3 3246 1            CAF     V6N60RTE    INPUT REENTRY ANGLE IN GAMMAEI
0254   REF   1              36,2515  0 3205 0            TCR     P37OFRB1      AND DESIRED DELTA V IN RTEDVO
0255                        36,2516  1 2514 1            TCF     -2          DISPLAY NEW DATA
0500   REF 214  LAST  841   36,2517  0 6006 1  RTE299    TC      INTPRET
0501                        36,2520   71331 0            SSP     DLOAD
0502   REF   1              36,2521   00122 0                    OVFIND
05025                       36,2522   00000 1                    0
0503   REF   7  LAST  761   36,2523   03767 1                    VPREC
0504   REF   4  LAST  840   36,2524   17632 0            STODL   RTEDVO
0505   REF   6  LAST  761   36,2525   03771 0                    GAMMAEI
0506   REF   3  LAST  273   36,2526   17634 0            STODL   RTEGAM2D
0509   REF   1              36,2527   31671 0                    1RTEB13
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0510  REF  2 LAST 124   36,2530   17735 0            STODL  CONICX1
0511  REF  1            36,2531   33756 0                   C4RTE
0512  REF  2 LAST 124   36,2532   37652 1            STCALL MAMAX1
0513  REF  1            36,2533   64423 0                   INVC100          GET R(T1)/,V(T1)/,URI/,UH/
0514                    36,2534   77545 0            DLOAD  EXIT
05145 REF  2 LAST 124   36,2535   03646 0                   R(T1)
0515  REF  2 LAST 284   36,2536   0 7171 1           TC     POLY
0516                    36,2537   00002 0            DEC    2
0517                    36,2540   02544 0            2DEC   181000434.8-31
0517                    36,2541   35436 0
0518                    36,2542   14040 0            2DEC   1.507851458-2
0518                    36,2543   05066 1
0519                    36,2544   44052 0            2DEC*  -6.49993057E-9827*
0519                    36,2545   60030 1
0520                    36,2546   26415 0            2DEC*  9.76938926E-18856*
0520                    36,2547   25057 1
0521  REF 215 LAST 841  36,2550   0 6006 1           TC     INTPRET
0522                    36,2551   77752 1            SL1
0525  REF  2 LAST 124   36,2552   17654 0            STODL  MAMAX2           C0+C1*R+C2*R**2+C3*R**3=MAMAX2 B30
0526  REF  1            36,2553   31721 1                   M9RTE828
0527  REF  2 LAST 124   36,2554   17730 0            STODL  NN1A
0528  REF  1            36,2555   33762 1                   K2RTE
0529  REF  2 LAST 124   36,2556   17636 1  RTE320    STODL  RCON             RCON=K2
0530  REF  4 LAST 841   36,2557   03634 0                   RTEGAM2D
0531                    36,2560   44254 1            BZE    BDSU
0532  REF  1            36,2561   74570 0                   RTE340           GOTORTE340 IF REENTRY ANGLE NOT INPUT
0533  REF  1            36,2562   31657 1                   1RTE82
05335                   36,2563   71406 0            PUSH   COS                                        PL02D
0534                    36,2564   73525 1            PDDL   SIN
0535                    36,2565   45465 1            BDDV   STADR                                      PL00D
0536  REF  1            36,2566   40051 1            STCALL X(T2)            X(T2)=COT(GAM2D)          B0
0537  REF  1            36,2567   74603 1                   RTE360
0538                    36,2570   45345 1  RTE340    DLOAD  DSU
0539  REF  3 LAST 842   36,2571   03646 0                   R(T1)
0540  REF  1            36,2572   33760 0                   K1RTE
0541                    36,2573   71240 1            BMN    DLOAD
0542  REF  1            36,2574   74600 1                   RTE350
0543  REF  1            36,2575   33766 0                   K4RTE
0544  REF  2 LAST 842   36,2576   37726 0            STCALL X(T2)            X(T2)=K4
0545  REF  2 LAST 842   36,2577   74603 1                   RTE360
0546                    36,2600   77745 1  RTE350    DLOAD
0547  REF  1            36,2601   33764 1                   K3RTE
0548  REF  3 LAST 842   36,2602   03726 1            STORE  X(T2)            X(T2)=K3
0549                    36,2603   77624 1  RTE360    CALL
0550  REF  1            36,2604   65132 1                   V2T100
0551                    36,2605   52054 1            BZE    GOTO
0552  REF  1            36,2606   74610 0                   RTE367
0553  REF  1            36,2607   74772 0                   RTEALRM
0554                    36,2610   77775 1  RTE367    VLOAD
0555  REF  2 LAST 124   36,2611   03640 0                   R(T1)/
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0556   REF   6  LAST  544   36,2612   16657 1          STODL  RVEC
0557   REF   3  LAST  842   36,2613   03636 1                 RCON
0558   REF   2  LAST   93   36,2614   26760 1          STOVL  RDESIRED
0559   REF   2  LAST  124   36,2615   03700 0                 V2(T1)/
0560   REF  10  LAST  546   36,2616   36746 1          STCALL VVEC
0561   REF   1               36,2617   64266 1                 TMRAD100
0562                         36,2620   77615 0          DAD
0563   REF   2  LAST  124   36,2621   03716 1                 T1
0570   REF   2  LAST  124   36,2622   17736 0          STODL  T2
0571   REF   5  LAST  842   36,2623   03634 0                 RTEGAM2D
0572                         36,2624   52054 1          BZE    GOTO
05725  REF   1               36,2625   74627 1                 RTE369
057251 REF   1               36,2626   74651 0                 RTE372
0573                         36,2627   51575 1  RTE369  VLOAD  ABVAL
0574   REF   2  LAST  124   36,2630   03710 1                 V(T2)/
0575                         36,2631   77776 1          EXIT
0576   REF   3  LAST  842   36,2632   0 7171 1         TC     POLY
0577                         36,2633   00002 0          DEC    2
0578                         36,2634   00000 1          2DEC   0
0578                         36,2635   00000 1
0579                         36,2636   47021 1          2DEC   -4.8760771E-284
0579                         36,2637   65002 0
0580                         36,2640   35610 0          2DEC   4.5419476E-4811
0580                         36,2641   07722 1
0581                         36,2642   63772 0          2DEC   -1.4317675E-6818
0581                         36,2643   63276 1
0582   REF 216  LAST  842   36,2644   0 6006 1         TC     INTPRET
05825                        36,2645   77615 0          DAD
058251 REF   1               36,2646   01352 1                 RTED1
0583                         36,2647   52052 1          SL3    GOTO            X(T2),=D1+D2V2+D3V2**2+D4V2**3
0587   REF   1               36,2650   74653 1                 RTE373
0588                         36,2651   77745 1  RTE372  DLOAD                  X(T2),=X(T2)
0589   REF   4  LAST  842   36,2652   03726 1                 X(T2)
05895                        36,2653   41425 1  RTE373  DSU    PUSH            X(T2)ERR                              B0 PL02D
058951 REF   5  LAST  843   36,2654   03726 1                 X(T2)
0590                         36,2655   53575 0          VLOAD  UNIT
0591   REF   2  LAST  124   36,2656   03656 1                 R(T2)/                                               858
0592   REF  13  LAST  763   36,2657   36152 1          STCALL ALPHAV
0593   REF   3  LAST  763   36,2660   26437 0                 GETERAD
0594                         36,2661   77615 0          DAD
0606   REF   1               36,2662   33772 0                 E3RTE
0607                         36,2663   45206 1          PUSH   DSU             RCON,=(E1/(1+E2BETA11)**.5)+E3 B29 PL04D
0608   REF   4  LAST  843   36,2664   03636 1                 RCON
0609                         36,2665   45246 0          ABS    DSU
0610   REF   1               36,2666   31756 1                 EPC2RTE
0611                         36,2667   52040 1          BMN    GOTO
0612   REF   1               36,2670   74672 1                 RTE374
0613   REF   1               36,2671   74677 1                 RTE375
0614                         36,2672   51545 1  RTE374  DLOAD  ABS
0615                         36,2673   00001 0                 ODD
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0617                                36,2674  50025 0          DSU    BMN
0618  REF   1                     36,2675  31760 1                 EPC3RTE
0620  REF   1                     36,2676  74747 0                 P37E
0621                                36,2677  43345 1  RTE375  DLOAD  DAD
0622  REF   3  LAST  842           36,2700  03730 0                 NN1A
0623  REF   1                     36,2701  31677 0                 1RTEB28
0624                                36,2702  67240 0          BMN    SLOAD
0625  REF   1                     36,2703  74707 1                 RTE380
0626  REF   1                     36,2704  31737 0                 OCT605
0627                                36,2705  77650 1          GOTO
0628  REF   2  LAST  842           36,2706  74772 0                 RTEALRM     TOO MANY ITERATIONS
0629  REF   4  LAST  844           36,2707  03730 0  RTE380  STORE  NN1A
0630                                36,2710  53025 0          DSU    BZE
0631  REF   1                     36,2711  31723 0                 M8RTEB28
0632  REF   1                     36,2712  74730 0                 RTE385
0633                                36,2713  45345 1          DLOAD  DSU
0634                                36,2714  00001 0                 OOD
0635  REF   2  LAST  124           36,2715  03666 1                 DRCON
0636                                36,2716  65301 0          NORM   PDDL        X(T2)ERR-X(T2)ERR,=Z1                PL06D
0637  REF  35  LAST  786           36,2717  00047 1                 X1
0638  REF   2  LAST  124           36,2720  03670 0                 RPRE,
0639                                36,2721  56225 1          DSU    DDV         X(T2)PRI-X(T2)=Z2                    PL04D
0640  REF   6  LAST  843           36,2722  03726 1                 X(T2)
06405                               36,2723  53605 1          DMP    SL*         DX(T2)=X(T2)ERR(Z2/Z1)
0641                                36,2724  00001 0                 OOD
06415                               36,2725  20201 0                 0,1
0642                                36,2726  77650 1          GOTO
06425 REF   1                     36,2727  74732 1                 RTE390
0643                                36,2730  77745 1  RTE385  DLOAD             DX(T2)=X(T2)ERR
06435                               36,2731  00001 0                 OOD
0644                                36,2732  14021 1  RTE390  STODL  16D         DX(T2)                               PL02D
06445                               36,2733  77626 0          STADR
0645  REF   5  LAST  843           36,2734  60141 0          STODL  RCON        RCON=RCON,
06455                               36,2735  77600 1          BOV
064551 REF  3  LAST  842           36,2736  74603 1                 RTE360
0646  REF   3  LAST  844           36,2737  17666 1          STODL  DRCON       X(T2)ERR,=X(T2)ERR
06465 REF   7  LAST  844           36,2740  03726 1                 X(T2)
0647  REF   3  LAST  844           36,2741  17670 0          STODL  RPRE,       X(T2)PRI=X(T2)
06475                               36,2742  00021 1                 16D
0648                                36,2743  77615 0          DAD
06485 REF   8  LAST  844           36,2744  03726 1                 X(T2)
0649  REF   9  LAST  844           36,2745  37726 0          STCALL X(T2)       X(T2)=X(T2)+DX(T2)
06495 REF   4  LAST  844           36,2746  74603 1                 RTE360      REITERATE
0650                                36,2747  77624 1  P37E    CALL               DISPLAY CONIC SOLUTION
0651  REF   1                     36,2750  74776 1                 RTEVR
0800                                36,2751  41345 0  RTE505  DLOAD  DMP
0801  REF   2  LAST  124           36,2752  03720 1                 PCON
0802  REF   2  LAST  124           36,2753  03754 1                 BETA1
0803                                36,2754  53021 1          BDSU   BZE
0804  REF   6  LAST  844           36,2755  03636 1                 RCON
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 0805   REF   1                36,2756   74764 1                RTE510
 0806                          36,2757   71240 1          BMN   DLOAD
 0807   REF   2  LAST  845     36,2760   74764 1                RTE510
 0808   REF   2  LAST  842     36,2761   31657 1                1RTEB2
 0809                          36,2762   77650 1          GOTO                  ENTRY NEAR APOGEE
 0810   REF   1                36,2763   74766 0                RTE515
 0811                          36,2764   57545 1  RTE510  DLOAD DCOMP         ENTRY NEAR PERIGEE
 0812   REF   3  LAST  845     36,2765   31657 1                1RTEB2
 0813   REF   2  LAST  124     36,2766   37761 0  RTE515  STCALL PHI2
 0814   REF   1                36,2767   64511 0                PREC100       PRECISION TRAJECTORY COMPUTATION
 0815                          36,2770   77654 0  RTE625  BZE
 0816   REF   1                36,2771   75024 0                P37G
 0817                          36,2772   77624 1  RTEALRM CALL
 0818   REF   1                36,2773   64251 0                P37GALRM
 08185                         36,2774   77776 1          EXIT
 0819   REF   2  LAST  199     36,2775   1 2502 0         TCF   P37             RECYCLE AFTER ALARM DISPLAY
R0824
R0825                                  RETURN TO EARTH DISPLAY SUBROUTINE

 0826                          36,2776   45020 1  RTEVN   STQ   CALL
 0829   REF   2  LAST  124     36,2777   03763 0                VNSTORE
 0830   REF   1                36,3000   64305 0                RTEDISP       DISPLAY PREPARATION
 0831                          36,3001   77776 1          EXIT
 0832   REF   1                36,3002   3 3244 0         CAF   V6N61RTE      LATITUDE,LONGITUDE,BLANK
 0833   REF   1                36,3003   0 3215 1         TCR   P370GOFR        IN LAT(SPL),LNG(SPL),-
 0834   REF   9  LAST  776     36,3004   3 4710 0         CAF   FOUR
 0835   REF   1                36,3005   0 3211 0         TCR   37BLANK +1
 0836                          36,3006   1 3013 1         TCF   +5
 0837   REF   3  LAST  845     36,3007   1 2502 0         TCF   P37             RECYCLE
 0841   REF   1                36,3010   3 3245 1         CAF   V6N39RTE       T21 HRS,MIN,SEC IN T3TOT4
 0844   REF   2  LAST  841     36,3011   0 3231 1         TCR   P370GOF
 0845   REF   4  LAST  845     36,3012   1 2502 0         TCF   P37             RECYCLE
 0847   REF   2  LAST  841     36,3013   3 3246 1         CAF   V6N60RTE       DISPLAY BLANK,V(T2),FPA2
 0848   REF   2  LAST  841     36,3014   0 3205 0         TCR   P37GFRB1          IN -,VPRED,GAMMAEI
 0849   REF   5  LAST  845     36,3015   1 2502 0         TCF   P37             RECYCLE
 0856   REF   1                36,3016   3 3247 0         CAF   V6N81RTE       DISPLAY DELTA V (LV) IN DELVLVC
 0859   REF   3  LAST  845     36,3017   0 3231 1         TCR   P370GOF
 0860   REF   6  LAST  845     36,3020   1 2502 0         TCF   P37             RECYCLE
 08615  REF 217  LAST  843     36,3021   0 6006 1         TCR   INTPRET
 0862                          36,3022    77650 1         GOTO
 0863   REF   3  LAST  845     36,3023    03763 0                VNSTORE

R0864   PRECISION DISPLAY,TARGETING COMPUTATION AND RTE END PROCESSING

 0865                          36,3024    77624 1  P37G    CALL
 0866   REF   2  LAST  844     36,3025    74776 1                RTEVN
 0867                          36,3026    77776 1          EXIT
 0868   REF  13  LAST  729     36,3027   3 4716 0  P37N    CAF   SEVEN
 0869   REF   9  LAST  606     36,3030   55*131 1         TS    OPTION1
 0870   REF  97  LAST  821     36,3031   3 4712 1         CAF   ONE
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0871   REF  11  LAST  692   36,3032  55'132 1          TS      OPTICN2
0872   REF   1               36,3033  3 3243 1          CAF     V4N06RTE        DISPLAY RCS OR SPS OPTION  SPS ASSUMED
0873   REF   4  LAST  845   36,3034  0 3231 1          TCR     P37OGOF
0874                        36,3035  1 3033 0          TCF     -2              RECYCLE
0875   REF 218  LAST  845   36,3036  0 6006 1          TC      INTPRET         PROCEED
0876                        36,3037   67201 0          SETPD   SLOAD
0877                        36,3040   00001 0                  OOD
0878   REF  12  LAST  846   36,3041   01133 1                  OPTICN2
0879                        36,3042   53025 0          DSU     BZE
0880   REF   2  LAST  841   36,3043   31671 0                  1RTEB13
0881   REF   1               36,3044   75053 0                  P37Q
0882                        36,3045   60345 0          DLOAD   NORM            SPS
0883   REF   2  LAST  651   36,3046   10362 1                  MDOTHI
0884   REF  36  LAST  844   36,3047   00047 1                  X1
0885                        36,3050   52125 0          PDDL    GOTO
0886   REF   1               36,3051   31727 1                  VCSPS
0887   REF   1               36,3052   75064 1                  P37T
0888                        36,3053   43145 0  P37Q    DLOAD   BON             RCS
0889   REF   1               36,3054   31733 1                  MDOTRCS
0890   REF   3  LAST  679   36,3055   00700 0                  NJETSFLG
0891   REF   1               36,3056   75060 0                  P37R
0892                        36,3057   77752 1          SL1
0893                        36,3060   77752 1  P37R    SL1
0894                        36,3061   65301 0          NORM    PDDL
0895   REF  37  LAST  846   36,3062   00047 1                  X1
0896   REF   1               36,3063   31731 0                  VCRCS
0897                        36,3064   56325 0  P37T    PDDL    DDV             DV/VC                  B7 -B5 = B2 PL02D
0898   REF   2  LAST  124   36,3065   03706 0                  DV
0899                        36,3066   77776 1          EXIT
0900   REF   4  LAST  843   36,3067  0 7171 1          TC      POLY
0901                        36,3070   00001 0          DEC     1
0902                        36,3071   00001 0          2DEC    5.66240507E-48-3
0902                        36,3072   05070 0
0903                        36,3073   17527 1          2DEC    9.79487897E-18-1
0903                        36,3074   36700 0
0904                        36,3075   47114 0          2DEC    -.38828195581
0904                        36,3076   70670 1
0905   REF 219  LAST  846   36,3077  0 6006 1          TC      INTPRET
0906                        36,3100   67206 1          PUSH    SLOAD           (1-E)**(-DV/VC)=A              B3 PL04D
0907   REF   8  LAST  680   36,3101   03076 0                  WEIGHT/G
0908                        36,3102   56205 0          DMP     DDV             DTB=(MO/MDOT)A         B16+B3-B3=B16 PL00D
0909                        36,3103   41257 1          SL*     DMP
0910                        36,3104   20165 1                  0 -120,1
0911   REF   1               36,3105   31735 1                  CSUBT
0912                        36,3106   77621 1          BDSU
0913   REF   3  LAST  843   36,3107   03716 1                  T1
0914   REF  65  LAST  674   36,3110   03413 1          STORE   TIG             TIG=T1-CT*DTB                  B28
0915                        36,3111   77776 1          EXIT
0916   REF   2  LAST  841   36,3112   3 3242 0          CAF     V6N33RTE        DISPLAY BIASED TIG
0917   REF   5  LAST  846   36,3113   0 3231 1          TCR     P37OGOF
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0918                                36,3114  1 3112 1          TCF     -2
09184  REF 153  LAST  837           36,3115  3 4714 1          CAF     ZERO
09185  REF  10  LAST  78C           36,3116  55'125 1          TS      VHFCNT
09186  REF   7  LAST  78C           36,3117  55'126 1          TS      TRKMKCNT
0919   REF 220  LAST  846           36,3120  0 6006 1          TC      INTPRET
09195                               36,3121   77624 1          CALL                CONICALLY INTEGRATE FROM R1,V1 OVER T12
091951 REF   1                      36,3122   65051 0                   RTENCK1
0920                                36,3123   53575 0          VLOAD   UNIT                                        PLOOD
092001 REF   3  LAST  843           36,3124   03656 1                   R(T2)/
092005                              36,3125   74315 0          PDVL    VXSC        UR2                         B1 PL06D
09201  REF   2  LAST  124           36,3126   03740 1                   UR1/
092015 REF   1                      36,3127   31742 1                   MCOS7.5
09202                               36,3130   74315 0          PDVL    VXSC        -UR1(COS7.5)                B1 PL12D
092025 REF   1                      36,3131   03746 1                   UH/
09203  REF   1                      36,3132   31744 1                   MSIN7.5
092035                              36,3133   50255 0          VAD     DOT         K/=-UR1(COS7.5)-UH(SIN7.5)  B2 PLOOD
09204                               36,3134   50015 0          DAD     BMN
092045 REF   1                      36,3135   31746 0                   MCOS22.5
09205  REF   1                      36,3136   75163 1                   P37W
092055                              36,3137   50375 0          VLOAD   DOT         K/ . UR2 GR COS22.5
09206  REF   2  LAST  847           36,3140   03746 1                   UH/
092065 REF   4  LAST  847           36,3141   03656 1                   R(T2)/
09207                               36,3142   71240 1          BMN     DLOAD
092075 REF   1                      36,3143   75147 1                   P37U
09208  REF   1                      36,3144   31750 1                   THETA165
092085                              36,3145   52006 0                   PUSH    GOTO
09209  REF   1                      36,3146   75151 0                   P37V
092095                              36,3147   41545 0  P37U     DLOAD   PUSH
0921   REF   1                      36,3150   31752 0                   THETA210
092105                              36,3151   77756 0  P37V     SIN
09211  REF   7  LAST  542           36,3152   16732 0          STODL   SNTH
092115                              36,3153   43146 0          COS     CLEAR
09212  REF   4  LAST  541           36,3154   03666 1                   RVSW
092125 REF   7  LAST  542           36,3155   26734 0          STOVL   CSTH
09213  REF   3  LAST  842           36,3156   03640 0                   R(T1)/
092135 REF   7  LAST  843           36,3157   26657 1          STOVL   RVEC
09214  REF   3  LAST  843           36,3160   03700 0                   V2(T1)/
092145 REF  11  LAST  843           36,3161   36746 1          STCALL  VVEC
09215  REF   5  LAST  542           36,3162   24737 1                   TIMETHET
0922                                36,3163   43014 0  P37W     CLEAR   CLEAR
0923   REF   8  LAST  663           36,3164   01267 0                   XDELVFLG
0924   REF   6  LAST  676           36,3165   03665 1                   NORMSW
0925                                36,3166   77214 0          SET     VLOAD
0926   REF   7  LAST  518           36,3167   01071 0                   FINALFLG
0927                                36,3170   77626 0          STADR
0928   REF  10  LAST  543           36,3171   60362 0          STODL   RTARG
0929   REF   6  LAST  542           36,3172   00037 0                   T
0933                                36,3173   77615 0          DAD
0934   REF   4  LAST  846           36,3174   03716 1                   T1
0936   REF  12  LAST  665           36,3175   27656 1          STOVL   TPASS4
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0937   REF   4  LAST  847   36,3176   03700 C                  V2(T1)/
0938                       36,3177   77651 C          VSU
0939   REF   2  LAST  124   36,3200   03672 1                  V(T1)/
0940   REF  11  LAST  664   36,3201   37646 1          STCALL  DELVSIN
0941   REF   5  LAST  518   36,3202   73005 C                  VN1645
0942                       36,3203   77650 1          GOTO
0943   REF   2  LAST  847   36,3204   75163 1                  P37W
R0948
R0949  SUBROUTINE TO GO TO GOFLASHR AND BLANK R1

0950                       36,3205   0 0006 1  P37GFRB1 EXTEND
0951   REF   2  LAST  124   36,3206   23'762 C          QXCH    SPRTEX
0952   REF   2  LAST  845   36,3207   0 3215 1          TCR     P370GOFR
0953   REF  98  LAST  845   36,3210   3 4712 1  37BLANK CAF     ONE
0954   REF  15  LAST  724   36,3211   0 5415 1          TCR     BLANKET
0955   REF 100  LAST  782   36,3212   1 5112 1          TCF     ENDOFJOB
0956   REF   3  LAST  848   36,3213   0 1762 C          TC      SPRTEX          RECYCLE
0957   REF   1              36,3214   1 3240 C          TCF     P37PROC         PROCEED
R0958
R0959  SUBROUTINE TO GO TO GOFLASHR

0960                       36,3215   0 0006 1  P370GOFR EXTEND
0961   REF   2  LAST  124   36,3216   23'733 1          QXCH    RTENCKEX
0962   REF 235  LAST  825   36,3217   0 4555 C          TCR     BANKCALL
0963   REF  19  LAST  749   36,3220    20763 1          CADR    GOFLASHR
0964   REF  67  LAST  752   36,3221   1 4106 C          TCF     GOTOPOOH        TERMINATE
0965                       36,3222   1 3225 C          TCF     +3
0966                       36,3223   1 3227 1          TCF     +4
0967   REF   3  LAST  848   36,3224   0 1733 1          TC      RTENCKEX        IMMEDIATE RETURN
0968   REF   4  LAST  848   36,3225   51'733 1          INDEX   RTENCKEX        PROCEED
0969                       36,3226   1 0004 1          TCF     0 +4
0970   REF   5  LAST  848   36,3227   51'733 1          INDEX   RTENCKEX        RECYCLE
0971                       36,3230   1 0003 C          TCF     0 +3
R0973
R0974  SUBROUTINE TO GO TO GOFLASH

0975                       36,3231   0 0006 1  P370GOF  EXTEND
0976   REF   4  LAST  848   36,3232   23'762 C          QXCH    SPRTEX
0977   REF 236  LAST  848   36,3233   0 4555 C          TCR     BANKCALL
0978   REF  41  LAST  751   36,3234    20624 C          CADR    GOFLASH
0979   REF  68  LAST  848   36,3235   1 4106 C          TCF     GOTOPOOH
0980                       36,3236   1 3240 C          TCF     +2
0981   REF   5  LAST  848   36,3237   0 1762 C          TC      SPRTEX
0982   REF   6  LAST  848   36,3240   51'762 C  P37PROC  INDEX   SPRTEX
0983                       36,3241   1 0001 1          TCF     0 +1
0985                       36,3242    01441 1  V6N33RTE VN      0633
0986                       36,3243    01006 C  V4N06RTE VN      0406
0987                       36,3244    01475 C  V6N61RTE VN      0661
0988                       36,3245    01447 1  V6N39RTE VN      0639
0989                       36,3246    01474 1  V6N60RTE VN      0660
```

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0990                    36,3247   01521 C  V6N81RTE VN      0681
0996                    32,2251                    BANK    32
0997  REF   1           32,2000                    SETLOC  RTE
0998                    32,2251                    BANK
0999  REF   1                                      COUNT   32/RTE
```

```
P1000   ALARM DISPLAY SUBROUTINE
 1050                           32,2251    77420 1  P370ALRM STQ     EXIT
 1051   REF    7  LAST  848     32,2252    03762 1                   SPRTEX
 1055   REF  267  LAST  838     32,2253  3 0154 1           CA        MPAC
 1056   REF    2  LAST  153     32,2254  0 5653 1           TC        VARALARM
 1057   REF    1                32,2255  3 2265 1           CAF       V5N09RTE
 1058   REF  237  LAST  848     32,2256  0 4555 C           TC        BANKCALL
 1059   REF   42  LAST  848     32,2257    20624 C          CADR      GOFLASH
 1060   REF   69  LAST  848     32,2260  1 4106 C           TCF       GOTOPOOH
 1061                           32,2261  1 2255 C           TCF       -4
 1062   REF  221  LAST  847     32,2262  0 6006 1           TC        INTPRET
 1063                           32,2263    77650 1          GOTO
 1064   REF    8  LAST  85C     32,2264    03762 1                   SPRTEX
 1065                           32,2265    01211 1  V5N09RTE VN      0509
```

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P2000 TIME RADIUS CALLING SUBROUTINE

R2001	INPUT				
R2002	RVEC	INITIAL POSITION VECTOR	VECTOR	B29	METERS
R2004	VVEC	INITIAL VELOCITY VECTOR	VECTOR	B7	METERS/CS
R2006	RDESIREC	FINAL RADIUS FOR WHICH TRANSFER TIME IS TO BE COMPUTED	DP	B29	METERS
R2008	CONICX1	X1 SETTING FOR CONIC SUBROUTINES -2 = EARTH	SP	B14	
R2010	OUTPUT				
R2011	R(T2)/	FINAL POSITION VECTOR	VECTOR	B29	METERS
R2013	V(T2)/	FINAL VELOCITY VECTOR	VECTOR	B7	METERS/CS
R2015	T12	TRANSFER TIME TO FINAL RADIUS	DP	B28	CS

```
2100                          32,2266  43020 1  TMRAD100 STQ     CLEAR
2101  REF  6  LAST  848       32,2267  03733 0            RTENCKEX
2102  REF  5  LAST  847       32,2270  03666 1            RVSW
2103                          32,2271  67164 0            AXC,2    SXA,2
2104                          32,2272  20000 0            OCT      20000
2105  REF  2  LAST   93       32,2273  02756 1            SGNRDOT
2106                          32,2274  45140 0            LXC,1    CALL
2107  REF  3  LAST  842       32,2275  03734 1                     CONICX1
2108  REF  1                  32,2276  25552 1                     TIMERAD
2109  REF  3  LAST  843       32,2277  27710 1            STOVL    V(T2)/                    PLOOD
2110                          32,2300  77626 0            STADR
2111  REF  5  LAST  847       32,2301  60121 0            STODL    R(T2)/
2112  REF  7  LAST  847       32,2302  00037 0                     T
2113  REF  3  LAST  125       32,2303  37724 1       STCALL T12
2114  REF  7  LAST  851       32,2304  03733 0                     RTENCKEX
```

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P2200 DISPLAY CALCULATION SUBROUTINE

R2201 DESCRIPTION
R2202 OUTPUT FOR DISPLAY IS CONVERTED TO PROPER UNITS AND PLACED IN OUTPUT STORAGE REGISTERS. LANDING SITE
R2204 COMPUTATION FOR DETERMINING LANDING SITE LATITUDE AND LONGITUDE IS INCLUDED IN THE ROUTINE.

R2206 CALLING SEQUENCE
R2207 L CALL
R2208 L+1 RTEDISP

R2209 SUBROUTINES CALLED
R2210 TMRADIOO
R2211 ALOEKLOL
R2212 LAT-LONG

R2213 ERASABLE INITIALIZATION REQUIRED
R2214 FLSHLIST
R2215 NONE
R2216 MPAC
R2217 NONE
R2218 OTHER

R2219	R(T2)/	FINAL POSITION VECTOR	VECTOR B29	METERS
R2221	V(T2)/	FINAL VELOCITY VECTOR	VECTOR B7	METERS/CS
R2223	T2	FINAL TIME	DP B28	CS
R2225	V2(T1)/	POST IMPULSE INITIAL VELOCITY VECTOR	VECTOR B7	METERS/CS
R2227	V(T1)/	INITIAL VELOCITY VECTOR	VECTOR B7	METERS/CS
R2229	UR1/	UNIT INITIAL VECTOR	VECTOR B1	
R2231	UH/	UNIT HORIZONTAL VECTOR	VECTOR B1	

R2233 OUTPUT

R2234	VPRED	VELOCITY MAGNITUDE AT 400,000 FT. ENTRY ALTITUDE	DP B7	METERS/CS
R2236	T3TOT4	TRANSIT TIME TO 400,000 FT. ENTRY ALTITUDE	DP B28	CS
R2238	GAMMAEI	FLIGHT PATH ANGLE AT 400,000 FT. ENTRY ALTITUDE	DP B0	REVS + ABOVE HORIZ
R2240	DELVLVC	INITIAL VELOCITY CHANGE VECTOR IN LOCAL VERTICAL COORD.	VECTOR B7	METERS/CS
R2242	LAT(SPL)	LATITUDE OF THE LANDING SITE	DP B0	REVS
R2244	LNG(SPL)	LONGITUDE OF THE LANDING SITE	DP B0	REVS

```
2275                          32,2305  77220 1  RTEDISP  STQ     VLOAD          DISPLAY
2276  REF  9  LAST  85C       32,2306  03762 1           SPRTEX
2277  REF  4  LAST  851       32,2307  03710 1           V(T2)/
2278                          32,2310  65256 0           UNIT    PDDL
2279                          32,2311  00045 0           36D
2280  REF  8  LAST  841       32,2312  17767 1           STODL   VPRED          V(T2)
2281  REF  3  LAST  843       32,2313  03736 0           T2
2282                          32,2314  77625 0           DSU
2283  REF  1                  32,2315  03413 1           SPRTETIG
2284  REF  2  LAST  265       32,2316  26641 0           STOVL   T3TOT4         T21
2285  REF  6  LAST  851       32,2317  03656 1           R(T2)/
2286                          32,2320  50256 0           UNIT    DOT
22865                         32,2321  77752 1           SL1
```

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2287                                32,2322   44326 C          ARCCOS BDSU
2288  REF   4  LAST  845           32,2323   31657 1                 1RTE82
2289  REF   7  LAST  841           32,2324   27771 C          STOVL  GAMMAEI        FLIGHT PATH ANGLE T2
2290  REF   5  LAST  848           32,2325   03700 C                 V2(T1)/
2291                                32,2326   41451 1          VSU    PUSH
2292  REF   3  LAST  848           32,2327   03672 1                 V(T1)/
2293                                32,2330   57441 1          DOT    DCOMP
2294  REF   3  LAST  847           32,2331   03740 1                 UR1/
2295                                32,2332   41515 C          PDVL   PUSH
2296                                32,2333   63345 C          DLOAD  PDVL
2297  REF   1                       32,2334   31701 C                 ZERORTE
2298                                32,2335   55441 C          DOT    VDEF
2299  REF   3  LAST  847           32,2336   03746 1                 UH/
22995                               32,2337   77772 C          VSL1
2300  REF  10  LAST  483           32,2340   27405 C          STOVL  DELVLVC        DV/ (LVC)
2301  REF   7  LAST  852           32,2341   03656 1                 R(T2)/
2302  REF   8  LAST  847           32,2342   02657 1          STORE  RVEC           ***** LANDING SITE COMPUTATION *****
2303                                32,2343   45246 C          ABVAL  DSU
2304  REF   1                       32,2344   31725 C                 3048ORTE
2305  REF   3  LAST  843           32,2345   26760 1          STOVL  RDESIRED
2306  REF   5  LAST  852           32,2346   03710 1                 V(T2)/
2307  REF  12  LAST  847           32,2347   36746 1          STCALL VVEC
2308  REF   2  LAST  843           32,2350   64266 1                 TMRAD100      R3,V3,T23 FROM TIMERAD
2309                                32,2351   53575 C          VLOAD  UNIT
2310  REF   8  LAST  853           32,2352   03656 1                 R(T2)/
2311                                32,2353   53515 C          PDVL   UNIT           UR3                          PL06D
2312  REF   6  LAST  853           32,2354   03710 1                 V(T2)/
2313                                32,2355   72441 C          DOT    SL1            GAMMAE=ARCSIN(UR3 . UV3)     PL00D
2314                                32,2356   65336 1          ARCSIN PDDL           V(T3)                        PL02D
2315                                32,2357   00045 C                 36D
2316                                32,2360   51525 1          PDDL   ABS
2317                                32,2361   45006 C          PUSH   CALL           /GAMMAE/                     PL04D
2318  REF   2  LAST  632           32,2362   64071 C                 AUGEKUGL      PHIE                         PL06D
2319                                32,2363   43215 C          DAD    DAD
2320  REF   4  LAST  851           32,2364   03724 C                 T12            T23
2321  REF   4  LAST  852           32,2365   03736 C                 T2
2322                                32,2366   14003 1          STODL  02D            T(LS)=T2+T23+TE
2323                                32,2367   00005 1                 04D
2324                                32,2370   77756 C          SIN
2325  REF   3  LAST  273           32,2371   17403 C          STODL  LNG(SPL)       LNG(SPL)=SIN(PHIE)           PL04D
2326                                32,2372   77746 1          COS
2327  REF   9  LAST  796           32,2373   03401 1          STORE  LAT(SPL)       LAT(SPL)=COS(PHIE)
2328                                32,2374   53575 C          VLOAD  UNIT
2329  REF   9  LAST  853           32,2375   03656 1                 R(T2)/
2330                                32,2376   41406 C          PUSH   PUSH
2331                                32,2377   53515 C          PDVL   UNIT                                         PL22D
2332  REF   7  LAST  853           32,2400   03710 1                 V(T2)/
2333                                32,2401   47315 C          PDVL   VXV
2334                                32,2402   53435 C          VXV    UNIT           UH3=UNIT(UR3 X UV3 X UR3)    PL10D
2335                                32,2403   63361 C          VXSC   PDVL
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2336   REF   4  LAST  853   32,2404   03403 C          LNG(SPL)
2337                       32,2405   53361 C   VXSC   VAD                                    PL04D
2338   REF  10  LAST  853   32,2406   03401 1          LAT(SPL)
2340                       32,2407   43014 C   CLEAR  CLEAR          T(LS) IN MPAC
2341   REF  11  LAST  796   32,2410   00662 C          ERADFLAG
2342   REF  20  LAST  796   32,2411   01663 C          LUNAFLAG
23425  REF  14  LAST  843   32,2412   16152 C   STODL  ALPHAV         ALPHAV=UR3(COSPHIE)+UH3(SINPHIE)  PL02D
2343                       32,2413   77624 1   CALL
2344   REF   6  LAST  753   32,2414   26322 C          LAT-LONG
2345                       32,2415   77745 1   DLOAD
2346   REF  12  LAST  796   32,2416   01104 C          LAT
2347   REF  11  LAST  854   32,2417   17401 1   STODL  LAT(SPL)       LATITUDE LANDING SITE   *****
2348   REF   7  LAST  599   32,2420   01106 1          LONG
2349   REF   5  LAST  854   32,2421   37403 1   STCALL LNG(SPL)       LONGITUDE LANDING SITE  *****
2350   REF  10  LAST  852   32,2422   03762 1          SPRTEX
2400   REF   2 LAST  849 TO  854:    106   106*  COUNT* $$/RTE
```

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P2500 INITIAL VECTOR SUBROUTINE

R2501 DESCRIPTION
R2502 A PRECISION INTEGRATION OF THE STATE VECTOR TO THE TIME OF IGNITION ISPERFORMED.PRECOMPUTATIONS OCCUR.

R2504 CALLING SEQUENCE
R2505 L CALL
R2506 L+1 INVC100

R2507 NORMAL EXIT MODE
R2508 AT L+2 OF CALLING SEQUENCE WITH MPAC = 0

R2509 ALARM EXIT MODE
R2510 AT L+2 OF CALLING SEQUENCE WITH MPAC = OCTAL 612 FOR STATE VECTOR IN MOONS SPHERE OF INFLUENCE

R2512 SUBROUTINES CALLED
R2513 CSMPREC

R2514 ERASABLE INITIALIZATION REQUIRED
R2515 FLSHLIST
R2516 NONE
R2517 MPAC
R2518 NONE
R2519 OTHER
R2520 SPRTETIG TIME OF IGNITION DP B28 CS
R2522 CSM STATE VECTOR

R2523 OUTPUT
R2524 R(T1)/ INITIAL POSITION VECTOR AT TIG VECTOR B29 METERS
R2526 V(T1)/ INITIAL VELOCITY VECTOR AT TIG VECTOR B7 METERS/CS
R2528 T1 INITIAL VECTOR TIME (TIG) DP B28 CS
R2530 UR1/ UNIT INITIAL VECTOR VECTOR B1
R2532 UH/ UNIT HORIZONTAL VECTOR VECTOR B1
R2534 CFPA COSINE OF INITIAL FLIGHT PATH ANGLE DP B1

```
2600                          32,2423  71220 1  INVC100  STQ     DLOAD
2601  REF  11  LAST  854     32,2424  03762 1           SPRTEX
2602  REF   2  LAST  852     32,2425  03413 1           SPRTETIG
2603  REF  44  LAST  731     32,2426  34041 C     STCALL TDEC1
2604  REF   6  LAST  695     32,2427  27022 1           CSMPREC   PRECISION INTEGRATION  R0,V0 TO R1,V1
2605                          32,2430  67175 0     VLOAD  SXA,2
2606  REF  33  LAST  731     32,2431  00001 C            RATT
2607  REF   2  LAST  124     32,2432  03755 C            P(T1)
2608  REF   4  LAST  847     32,2433  27640 C     STOVL  R(T1)/
2609  REF  22  LAST  731     32,2434  00007 C            VATT
2610  REF   4  LAST  853     32,2435  17672 1     STODL  V(T1)/
2611  REF   7  LAST  501     32,2436  00015 C            TAT
2612  REF   5  LAST  847     32,2437  03716 1     STORE  T1
2613                          32,2440  53135 C     SLOAD  BZE
2614  REF   3  LAST  855     32,2441  03756 C            P(T1)
```

```
2615  REF  1                 32,2442  64446 C                 INVC109
2624                         32,2443  52135 1  INVC107  SLOAD  GOTO
2625  REF  1                 32,2444  31740 C                 OCT612
2626  REF  3  LAST  844      32,2445  74772 C                 RTEALRM   R1,V1 NOT IN PROPER SPHERE OF INFLUENCE
2650                         32,2446  53575 C  INVC109  VLOAD  UNIT
2651  REF  5  LAST  855      32,2447  C3640 C                 R(T1)/
2652  REF  4  LAST  853      32,2450  17740 1          STODL  UR1/      UR1/                          B1
2653                         32,2451  00045 C                 36D
2654  REF  4  LAST  842      32,2452  27646 C          STOVL  R(T1)     R(T1)                         B29
2655  REF  5  LAST  855      32,2453  03672 1                 V(T1)/
2656                         32,2454  77656 1          UNIT
2657  REF  3  LAST  125      32,2455  03746 1          STORE  UV1/
2658                         32,2456  72441 C          DOT    SL1
2659  REF  5  LAST  856      32,2457  03740 1                 UR1/
2660  REF  2  LAST  124      32,2460  03757 1          STORE  CFPA      CFPA                          B1
2661                         32,2461  45246 C          ABS    DSU
2662  REF  1                 32,2462  31754 C                 EPCIRTE
2663                         32,2463  71240 1          BMN    DLOAD
2664  REF  1                 32,2464  64473 C                 INVC115   NOT NEAR RECTILINEAR
2665  REF  5  LAST  853      32,2465  31657 1                 IRTEB2
2666                         32,2466  41525 C          PDDL   PUSH
2668  REF  2  LAST  853      32,2467  31701 C                 ZERORTE
2669                         32,2470  41466 C          VDEF   PUSH      N/ = (0,0,1)
2670                         32,2471  77650 1          GOTO
2671  REF  1                 32,2472  64477 1                 INVC120
2672                         32,2473  47375 C  INVC115  VLOAD  VXV
2673  REF  6  LAST  856      32,2474  03740 1                 UR1/
2674  REF  4  LAST  856      32,2475  03746 1                 UV1/
2675                         32,2476  77606 1          PUSH             N/ = UR X UV                  B2
2676                         32,2477  41545 C  INVC120  DLOAD  PUSH
2677                         32,2500  77244 C          BPL    VLOAD
2678  REF  1                 32,2501  64503 C                 INVC125
2683                         32,2502  41476 1          VCOMP  PUSH      CORRECT N/ FOR RETROGRADE TRAJECTORY
2684                         32,2503  77775 1  INVC125  VLOAD
2685                         32,2504  53435 C          VXV    UNIT
2686  REF  7  LAST  856      32,2505  03740 1                 UR1/
2687  REF  4  LAST  853      32,2506  03746 1          STORE  UH/       UH/                           B1
2688                         32,2507  77650 1          GOTO
2689  REF  12 LAST  855      32,2510  03762 1                 SPRTEX
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P3000 PRECISION TRAJECTORY COMPUTATION SUBROUTINE

R3001 DESCRIPTION
R3002 A NUMERICALLY INTEGRATED TRAJECTORY IS GENERATED WHICH FOR THE RETURN TO EARTH PROBLEM SATISFIES THE REENTRY
R3004 CONSTRAINTS (RCON AND X(T2)) ACHIEVED BY THE INITIAL CONIC TRAJECTORY AND MEETS THE DVD REQUIREMENT AS CLOSELY
R3006 AS POSSIBLE.
R3007
R3010 CALLING SEQUENCE
R3011 L CALL
R3012 L+1 PREC100

R3013 NORMAL EXIT MODE
R3014 AT L+2 OF CALLING SEQUENCE WITH MPAC = 0

R3015 ALARM EXIT MODE
R3016 AT L+2 OF CALLING SEQUENCE WITH MPAC =
R3017 OCTAL 605 FOR EXCESS ITERATIONS
R3018 OCTAL 613 FOR REENTRY ANGLE OUT OF LIMITS

R3019 SUBROUTINES CALLED
R3020 INTSTALL
R3021 RTENCK2
R3021S RTENCK3
R3022 TIMERAC
R3023 PARAM
R3024 V2TICC

R3025 ERASABLE INITIALIZATION REQUIRED
R3026 FLSHLIST
R3027 NONE
R3028 MPAC
R3029 NONE
R3030 OTHER

R3031	R(T1)/	INITIAL POSITION VECTOR	VECTOR B29/B27	METERS
R3033	V2(T1)/	POST IMPULSE INITIAL VELOCITY VECTOR	VECTOR B7/B5	METERS/CS
R3035	V(T1)/	INITIAL VELOCITY VECTOR	VECTOR B7/B5	METERS/CS
R3039	T1	INITIAL VECTOR TIME	DP B28	CS
R3041	T12	INITIAL TO FINAL POSITION TIME	DP B28	CS
R3045	RCON	CONIC FINAL RADIUS	DP B29/B27	METERS
R3047	R(T1)	MAGNITUDE OF INITIAL POSITION VECTOR	DP B29/B27	METERS
R3049	X(T2)	COTANGENT OF FINAL FLIGHT PATH ANGLE	DP B0	
R3051	X(T1)	COTANGENT OF INITIAL FLIGHT PATH ANGLE	DP B5	
R3057	RTEDVD	DELTA VELOCITY DESIRED	DP B7/B5	METERS/CS
R3059	MAMAX1	MAJOR AXIS LIMIT FOR LOWER BOUND ON GAMDV ITERATOR	DP B30/B28	METERS
R3061	MAMAX2	MAJOR AXIS LIMIT FOR UPPER BOUND ON GAMDV ITERATOR	DP B30/B28	METERS
R3063	UR1/	UNIT INITIAL VECTOR	VECTOR B1	
R3065	UH/	UNIT HORIZONTAL VECTOR	VECTOR B1	
R3067	BETA1	1+X(T2)**2	DP B1	
R3069	PHI2	PERIGEE OR APOGEE INDICATOR	DP B2	-1 PERIGEE,+1 APOGEE

R3071

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```
R3072   OUTPUT
R3073     V2(T1)/       POST IMPULSE INITIAL VELOCITY VECTOR          VECTOR  B7      METERS/CS
R3075     R(T2)/        FINAL POSITION VECTOR                         VECTOR  B29     METERS
R3077     V(T2)/        FINAL VELOCITY VECTOR                         VECTOR  B7      METERS/CS
R3079     T2            FINAL TIME                                    DP      B28     CENTISECONDS
R3081
R3100   DEBRIS
R3101     RC            FINAL R DESIRED                               DP      B29/B27 METERS
R3111     R/APRE        R/A                                           DP      B6
R3113     P/RPRE        P/R                                           DP      B2
R3115     RPRE          MAGNITUDE OF R(T2)/                           DP      B29/B27 METERS
R3117     X(T2)PRE      COTANGENT OF GAMMA2                           DP      B0
R3119     DT12          CORRECTION TO FINAL TIME T2                   DP      B28     CENTISECONDS
R3121     RCON          FINAL RADIUS                                  DP      B29/B27 METERS
R3123     DRCON         DELTA RCON                                    DP      B29/B27 METERS
R3125
 3150                                 32,2511  71220 1  PREC100  STQ     DLOAD
 3151   REF  13  LAST  856            32,2512  03762 1           SPRTEX
 3156   REF   1                      32,2513  31707 C           1ORTE
 3157   REF   5  LAST  844            32,2514  17730 C           STODL   NN1A
 3158   REF   7  LAST  844            32,2515  03636 1           RCON
 3159   REF   2  LAST  124            32,2516  03664 C           STORE   RD
 3164                                 32,2517  77745 1  PREC120  DLOAD
 31645  REF   1                      32,2520  31717 1           2RTEB1
 31646  REF   2  LAST  124            32,2521  17650 1           STODL   DT21PR          DT21PR = POSMAX
 3165   REF   1                      32,2522  31705 1           M15RTE
 3166   REF   2  LAST  124            32,2523  37732 C           STCALL  NN2
 3169   REF   1                      32,2524  65077 1           RTENCK3
 3170                                 32,2525  77624 1  PREC125  CALL
 3171   REF   1                      32,2526  11524 1           PARAM
 3172                                 32,2527  77745 1           DLOAD
 3173   REF   2  LAST   93            32,2530  02742 1           P
 3222   REF   1                      32,2531  14033 1           STODL   P/RPRE
 3223   REF   2  LAST   93            32,2532  02744 1           R1A
 3224   REF   1                      32,2533  14035 1           STODL   R/APRE  <----
 3225   REF   1                      32,2534  00041 1           R1
 3226   REF   1                      32,2535  14031 C           STODL   RPRE
 3227   REF   3  LAST  123            32,2536  03775 1           COGA
 3228                                 32,2537  77661 C           SL
 3229                                 32,2540  20206 1           5
 3230   REF   1                      32,2541  03724 C           STORE   X(T2)PRE
 3241                                 32,2542  43276 C           DCOMP   DAD
 3242   REF  10  LAST  844            32,2543  03726 1           X(T2)
 3243                                 32,2544  45246 C           ABS     DSU
 3244   REF   1                      32,2545  31762 C           EPC4RTE
 3245                                 32,2546  50000 1           BOV     BMN
 32455  REF   1                      32,2547  64551 1           PREC130
 3246   REF   1                      32,2550  64732 C           PREC175

R3247   DESIRED REENTRY ANGLE NOT ACHIEVED
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3248                                32,2551  50145 1  PREC130  DLOAD   BMN
3249   REF  3  LAST  858            32,2552  03732 1                   NN2
3250   REF  1                       32,2553  64557 1                   PREC140
3251                                32,2554  52135 1  PREC132  SLOAD   GOTO        TOO MANY ITERATIONS
3252   REF  2  LAST  844            32,2555  31737 C                   OCT605          EXIT WITH ALARM
3253   REF  1                       32,2556  65047 1                   PRECX

R3259  DETERMINE RADIUS AT WHICH THE DESIRED REENTRY ANGLE WILL BE ACHIEVED

3260                                32,2557  53145 1  PREC140  DLOAD   BZE
3261   REF  6  LAST  858            32,2560  03730 C                   NN1A
3264   REF  1                       32,2561  64612 C                   PREC162
3265                                32,2562  42545 C  PREC150  DLOAD   SL4         ELLIPTIC CASE
3266   REF  2  LAST  858            32,2563  00035 1                   R/APRE
32665                               32,2564  52525 1           PDDL    SL3                                  PL02D
3267   REF  2  LAST  858            32,2565  00033 1                   P/RPRE
3268                                32,2566  41205 C           DMP     DMP         (P/A)BETA1               84 PL00D
3269   REF  3  LAST  844            32,2567  03754 1                   BETA1
3270                                32,2570  57512 C           SL2     DCOMP
3271                                32,2571  50015 C           DAD     BMN         1-(P/A)BETA1=BETA2       B2
3272   REF  6  LAST  856            32,2572  31657 1                   1RTEB2
3273   REF  1                       32,2573  64576 1                   PREC155
3274                                32,2574  52166 1           SQRT    GOTO        BETA2**.5=BETA3          B1
3275   REF  1                       32,2575  64600 C                   PREC160
3276                                32,2576  77745 1  PREC155  DLOAD
3277   REF  3  LAST  856            32,2577  31701 C                   ZERORTE     BETA3=0
3278                                32,2600  43205 1  PREC160  DMP     DAD
3279   REF  3  LAST  845            32,2601  03761 1                   PHI2
3280   REF  1                       32,2602  31661 1                   1RTEB3
3281                                32,2603  60325 C           PDDL    NORM        1+(PHI2)(BETA3)          B3
3282   REF  3  LAST  859            32,2604  00035 1                   R/APRE
3283   REF 38  LAST  846            32,2605  00047 1                   X1
3284                                32,2606  77665 1           BDDV                                         PL00D
3285                                32,2607  52057 1           SL*     GOTO        (1+PHI2*BETA3)/(R/A)=BETA4 B1
3286                                32,2610  20175 C                   0 -4,1
3287   REF  1                       32,2611  64620 1                   PREC165
3288                                32,2612  60345 C  PREC162  DLOAD   NORM
32885  REF  2  LAST  858            32,2613  00031 C                   RPRE
3289   REF 35  LAST  859            32,2614  00047 1                   X1
32895                               32,2615  53665 1           BDDV    SL*         BETA4=RD/RPRE            B1
3290   REF  3  LAST  858            32,2616  03664 C                   RD
32905                               32,2617  20200 1                   0 -1,1
3291                                32,2620  45206 1  PREC165  PUSH    DSU
3292   REF  1                       32,2621  31655 C                   1RTEB1
32923                               32,2622  77676 C           DCOMP
329235 REF  2  LAST  117            32,2623  03765 C           STORE   BETA12
32924                               32,2624  71240 1           BMN     DLOAD
329243 REF  1                       32,2625  64636 C                   PREC168
329247 REF  2  LAST  858            32,2626  03724 C                   X(T2)PRE
32925                               32,2627  71240 1           BMN     DLOAD
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329253 REF   1                32,2630  64634 1                PREC167
329257 REF   3  LAST  859      32,2631  03765 C                BETA12
32926                         32,2632  77676 C          DCOMP
329265 REF   4  LAST  860      32,2633  03765 C          STORE BETA12
32927                         32,2634  77745 1  PREC167 DLOAD
329275 REF   5  LAST  860      32,2635  03765 C                BETA12
3293                          32,2636  45246 C  PREC168 ABS   DSU
3294   REF   1                32,2637  31766 1                EPC6RTE
3295                          32,2640  71240 1          BMN   DLOAD
3296   REF   2  LAST  858      32,2641  64732 C                PREC175
3297                          32,2642  72405 C          DMP   SL1
3298   REF   3  LAST  859      32,2643  00031 C                RPRE
3299                          32,2644  77606 1          PUSH
3300                          32,2645  43345 1  PREC170 DLOAD DAD
3301   REF   4  LAST  859      32,2646  03732 1                NN2
3302   REF   2  LAST  844      32,2647  31677 C                1RTEB28
3303   REF   5  LAST  860      32,2650  03732 1          STORE NN2
3304                          32,2651  43175 C          VLOAD SET
3305   REF  10  LAST  853      32,2652  03656 1                R(T2)/
3306   REF   6  LAST  851      32,2653  03466 C                RVSW
3307   REF   9  LAST  853      32,2654  26657 1          STOVL RVEC
3308   REF   8  LAST  853      32,2655  03710 1                V(T2)/
3309                          32,2656  77765 C          SIGN
3310   REF   6  LAST  860      32,2657  03765 C                BETA12
3311   REF  13  LAST  853      32,2660  16746 C          STODL VVEC
3312   REF   2  LAST  859      32,2661  31655 C                1RTEB1
3313                          32,2662  57565 C          SIGN  DCOMP
3314   REF   7  LAST  860      32,2663  03765 C                BETA12
3315                          32,2664  71354 C          LXA,2 DLOAD
3316   REF 288  LAST  850      32,2665  00154 1                MPAC
3317                          32,2666  67140 C          LXC,1 SXA,2
3318   REF   4  LAST  851      32,2667  03734 1                CONICX1
3320   REF   3  LAST  851      32,2670  02756 1                SGNRDOT
3321   REF   4  LAST  853      32,2671  36760 C          STCALL RDESIRED      COMPUTE DT12 (CORRECTION TO TIME OF
3322   REF   2  LAST  851      32,2672  25552 1                TIMERAD                NEW RADIUS)
3323                          32,2673  75345 1          DLOAD SIGN
3324   REF   8  LAST  851      32,2674  00037 C                T
3325   REF   8  LAST  860      32,2675  03765 C                BETA12
3326                          32,2676  60325 C          PDDL  NORM           DT21=(PHI4)CT21                    PL02D
3327   REF   3  LAST  858      32,2677  03650 1                DT21PR
3328   REF  40  LAST  859      32,2700  00047 1                X1
3329                          32,2701  53665 1          BDDV  SL*
3330                          32,2702  00001 C                ONE
33305                         32,2703  20176 C                0 -3,1
3331                          32,2704  50006 1          PUSH  BMN            BETA13=(DT21)/(DT21PR)          B3 PL04D
33315  REF   1                32,2705  64712 1                PREC172
3332                          32,2706  65345 C          DLOAD PDDL           BETA14=1                        B0 PL04D
33325  REF   2  LAST  858      32,2707  31717 1                2RTEB1
3333                          32,2710  77650 1          GOTO
33335  REF   1                32,2711  64714 1                PREC173
```

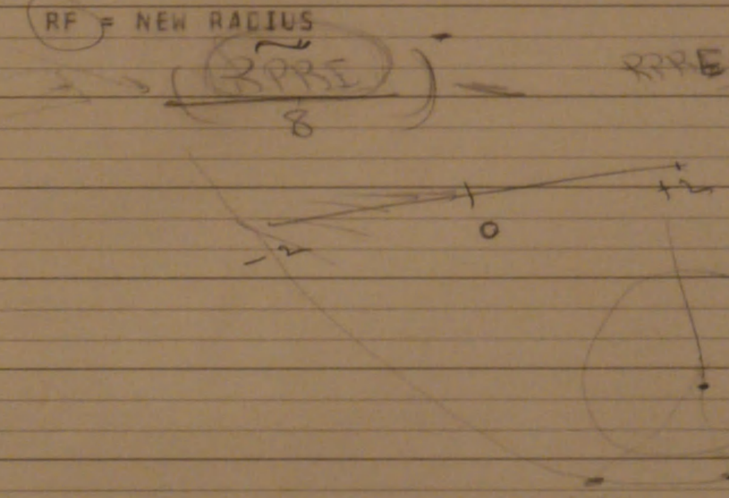

```
3334                          32,2712  65345 0  PREC172  DLOAD   PDDL          BETA14=.6                          B0 PL04D
33345 REF  1                  32,2713  31711 1                   M.6RTE
3335                          32,2714  45271 1  PREC173  DDV     DSU
33355                         32,2715  00003 1                   02D
3336  REF  2  LAST  859       32,2716  31661 1                   1RTEB3
33365                         32,2717  71240 1           BMN     DLOAD
3337  REF  1                  32,2720  64724 1                   PREC174
33375                         32,2721  77605 1           DMP
3338  REF  4  LAST  860       32,2722  03650 1                   DT21PR
33385                         32,2723  00001 0           STORE   OOD           DT21=(BETA14)DT21PR                B28
3339                          32,2724  41545 0  PREC174  DLOAD   PUSH
33395                         32,2725  00001 0                   OOD
3340  REF  5  LAST  861       32,2726  37650 0           STCALL  DT21PR
3341  REF  1                  32,2727  65061 0                   RTENCK2
3342                          32,2730  77650 1           GOTO
3343  REF  1                  32,2731  64525 1                   PREC125
3356                          32,2732  45345 1  PREC175  DLOAD   DSU
3357  REF  4  LAST  860       32,2733  00031 0                   RPRE
3358  REF  4  LAST  859       32,2734  03664 0                   RD
3359                          32,2735  51406 1           PUSH    ABS           RPRE-RD = RERR
3360                          32,2736  50025 0           DSU     BMN
3361  REF  1                  32,2737  31770 0                   EPC7RTE
3362  REF  1                  32,2740  65033 1                   PREC220
R3363 DESIRED RADIUS HAS NOT BEEN ACHIEVED
3364                          32,2741  53145 1           DLOAD   BZE
3365  REF  7  LAST  859       32,2742  03730 0                   NN1A
3366  REF  1                  32,2743  64554 1                   PREC132       TOO MANY ITERATIONS
3367                          32,2744  53025 0           DSU     BZE
3368  REF  2  LAST  858       32,2745  31707 0                   1ORTE
3369  REF  1                  32,2746  65001 0                   PREC207
3370                          32,2747  45345 1  PREC205  DLOAD   DSU           NOT FIRST PASS OF ITERATION
3371  REF  4  LAST  844       32,2750  03670 0                   RPRE,
3372  REF  9  LAST  861       32,2751  00031 0                   RPRE          RPRE,-RPRE                 B29/B27
3373                          32,2752  55301 0           NORM    BDDV
3374  REF 15  LAST  786       32,2753  00050 1                   X2
3375  REF  4  LAST  844       32,2754  03666 1                   DRCON
33755                         32,2755  41457 1           SL*     PUSH          DRCON/(RPRE,-RPRE)=S               B2
3376                          32,2756  57600 0                   0 -2,2
33765                         32,2757  40015 1           DAD     BOV           S GR +4 OR LS -4
3377  REF  3  LAST  860       32,2760  31655 0                   1RTEE1
33775 REF  1                  32,2761  64766 1                   PREC205M
3378                          32,2762  45246 0           ABS     DSU
33785 REF  4  LAST  861       32,2763  31655 0                   1RTEB1
3379                          32,2764  77640 0           BMN
33795 REF  1                  32,2765  64771 1                   PREC206
3380                          32,2766  57545 1  PREC205M DLOAD   DCOMP         S GR 0 OR LS -4
33805 REF  3  LAST  860       32,2767  31717 1                   2RTEB1
3381                          32,2770  77725 1           PDDL                  S=-4                               B2
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33815                                32,2771  41345 0  PREC206  DLOAD   DMP
3382                                 32,2772  77712 0           SL2
33825  REF   5  LAST  861            32,2773  03666 1           STORE   DRCON          DRCON=S(RERR)                    829
3383                                 32,2774  77615 0           DAD
3384   REF   8  LAST  858            32,2775  03636 1                   RCON
3385   REF   9  LAST  862            32,2776  03636 1           STORE   RCON          RCON+DRCON=RCON
3386                                 32,2777  77650 1           GOTO
3387   REF   1                       32,3000  65020 0                   PREC210
3388                                 32,3001  63545 0  PREC207  DLOAD   DSQ           FIRST PASS OF ITERATION
3389   REF   5  LAST  861            32,3002  03664 0                   RD
3390                                 32,3003  70501 1           NORM    SR1
3391   REF  41  LAST  86C            32,3004  00047 1                   X1
3392                                 32,3005  60325 0           PDDL    NORM
3393   REF   6  LAST  861            32,3006  00031 0                   RPRE
3394   REF  16  LAST  861            32,3007  00050 1                   X2
3395                                 32,3010  55260 0           XSU,1   BDDV
3396   REF  17  LAST  862            32,3011  00047 1                   X2
3397                                 32,3012  77657 0           SR*
3398                                 32,3013  20600 0                   0 -1,1
3399   REF  10  LAST  862            32,3014  03636 1           STORE   RCON          RD**2/RPRE=RCON
3400                                 32,3015  77625 0           DSU
3401   REF   6  LAST  862            32,3016  03664 0                   RD
3402   REF   6  LAST  862            32,3017  03666 1           STORE   DRCON         RCON-RD=DRCON
3403                                 32,3020  77745 1  PREC210  DLOAD                  PREPARE FOR NEXT ITERATION
3404   REF   7  LAST  862            32,3021  00031 0                   RPRE
3405   REF   5  LAST  861            32,3022  17670 0           STODL   RPRE,
3406   REF   8  LAST  861            32,3023  03730 0                   NN1A
3407                                 32,3024  77625 0           DSU
3408   REF   3  LAST  86C            32,3025  31677 0                   1RTEE28
3409   REF   9  LAST  862            32,3026  37730 1           STCALL  NN1A
3410   REF   2  LAST  842            32,3027  65132 1                   V2T10C
3411                                 32,3030  52030 0           BHIZ    GOTO
3412   REF   1                       32,3031  64517 0                   PREC120
3413   REF   2  LAST  859            32,3032  65047 1                   PRECX

R3414  DESIRED RADIUS ACHIEVED

3415                                 32,3033  45345 1  PREC220  DLOAD   DSU
3416   REF  11  LAST  858            32,3034  03726 1                   X(T2)
3417   REF   3  LAST  859            32,3035  03724 0                   X(T2)PRE
3418                                 32,3036  45246 0           ABS     DSU
3419   REF   1                       32,3037  31772 1                   EPC8RTE
3420                                 32,3040  67240 0           BMN     SLOAD
3421   REF   1                       32,3041  65045 0                   PREC225
3422   REF   1                       32,3042  31741 1                   OCT613
3423                                 32,3043  77650 1           GOTO
3424   REF   3  LAST  862            32,3044  65047 1                   PRECX         IF REENTRY ANGLE OUT OF LIMITS

R3425  DESIRED FINAL ANGLE HAS BEEN REACHED
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3429                              32,3045   77745 1  PREC225  DLOAD
3430   REF   4  LAST  859         32,3046   31701 0                    ZERORTE
3431                              32,3047   77650 1  PRECX    GOTO
3432   REF  14  LAST  858         32,3050   03762 1                    SPRTEX
```

P38C0 INTEGRATION CALLING SUBROUTINE

R3801 DESCRIPTION
R3802 PERFORMS CONIC AND PRECISION INTEGRATIONS USING SUBROUTINE INTEGRVS. THERE ARE THREE ENTRANCES (RTENCK1,
R3804 RTENCK2 AND RTENCK3) FOR DIFFERENT SOURCES OF INPUT AND DIFFERENT OPTIONS. THERE IS A COMMON SET OF OUTPUT
R3806 WHICH INCLUDES SET UP OF INPUT FOR THE PARAM SUBROUTINE

R3807 RTENCK1 (CONIC INTEGRATION)

R3808 CALLING SEQUENCE
R3809 L CALL
R3810 L+1 RTENCK1

R3811 ERASABLE INITIALIZATION REQUIRED
R3812 SAME AS FOR THE RTENCK3 ENTRANCE

R3813 RTENCK2 (PRECISION INTEGRATION)

R3814 CALLING SEQUENCE
R3815 L CALL
R3816 L+1 RTENCK2

R3817 ERASABLE INITIALIZATION REQUIRED
R3818 PUSHLIST
R3819 PUSHLOC-2 INTEGRATION TIME DT12 (CORRECTION TO T2) DP B28 CS
R3821 OTHER
R3822 R(T2)/ FINAL POSITION VECTOR VECTOR .B29 METERS
R3824 V(T2)/ FINAL VELOCITY VECTOR VECTOR B7 METERS/CS
R3826 T2 FINAL TIME DP B28 CS

R3828 RTENCK3 (PRECISION INTEGRATION)

R3829 CALLING SEQUENCE
R3830 L CALL
R3831 L+1 RTENCK3

R3832 ERASABLE INITIALIZATION REQUIRED
R3834 R(T1)/ INITIAL POSITION VECTOR VECTOR B29 METERS
R3836 V2(T1)/ POST IMPULSE INITIAL VELOCITY VECTOR VECTOR B7 M/CS
R3838 T1 INITIAL VECTOR TIME DP B28 CS
R3840 T2 FINAL TIME DP B28 CS

R3842 EXIT MODE
R3843 AT L+2 OF CALLING SEQUENCE
R3844 SUBROUTINES CALLED
R3845 INTSTALL
R3846 INTEGRVS

R3847 OUTPUT
R3848 PUSHLIST

L P37,P7C USER'S PAGE NO. 26 E7 S3

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R3849       PUSHLOC-6   FINAL POSITION VECTOR R(T2)/                VECTOR  829     METERS
R3851       X1          CONICS MUTABLE ENTRY FOR EARTH (-2)         SP      B14
R3853     MPAC
R3854                   FINAL VELOCITY VECTOR V(T2)/                VECTOR  87      M/CS
R3856     OTHER
R3857       R(T2)/      AS IN PUSHLIST
R3858       V(T2)/      AS IN MPAC
R3859       T2          FINAL TIME                                  DP      B28     CS
R3861

 3897                                32,3051   45020 1  RTENCK1  STQ     CALL
 3898   REF   8  LAST  851          32,3052   03733 0                   RTENCKEX
 3899   REF  18  LAST  622          32,3053   27371 1                   INTSTALL
 3900                                32,3054   43175 0           VLOAD   SET
 3901   REF   6  LAST  856          32,3055   03640 0                   R(T1)/
 3902   REF  10  LAST  599          32,3056   01473 0                   INTYPFLG
 3903                                32,3057   77650 1           GOTO
 3904   REF   1                     32,3060   65105 0                   RTENCK3B
R3905

 3906                                32,3061   45020 1  RTENCK2  STQ     CALL
 3907   REF   9  LAST  865          32,3062   03733 0                   RTENCKEX
 3908   REF  19  LAST  865          32,3063   27371 1                   INTSTALL
 3909                                32,3064   77214 0           CLEAR   VLOAD
 3910   REF  11  LAST  865          32,3065   01673 1                   INTYPFLG
 3911   REF  11  LAST  86C          32,3066   03656 1                   R(T2)/
 3912   REF  10  LAST  501          32,3067   25535 0           STOVL   RCV
 3913   REF   9  LAST  86C          32,3070   03710 1                   V(T2)/
 3914   REF   9  LAST  501          32,3071   15543 1           STODL   VCV
 3915   REF   5  LAST  853          32,3072   03736 0                   T2
 3916   REF  10  LAST  501          32,3073   01517 0           STORE   TET
 3917                                32,3074   77615 0           DAD
 3918                                32,3075   77650 1           GOTO
 3919   REF   1                     32,3076   65113 1                   RTENCK3D

R3920
 3921                                32,3077   45020 1  RTENCK3  STQ     CALL
 3922   REF  10  LAST  865          32,3100   03733 0                   RTENCKEX
 3923   REF  20  LAST  865          32,3101   27371 1                   INTSTALL
 3925                                32,3102   43175 0  RTENCK3A VLOAD   CLEAR
 3926   REF   7  LAST  865          32,3103   03640 0                   R(T1)/
 3927   REF  12  LAST  865          32,3104   01673 1                   INTYPFLG
 3928   REF  11  LAST  865          32,3105   25535 0  RTENCK3B STOVL   RCV
 3929   REF   6  LAST  853          32,3106   03700 0                   V2(T1)/
 3930   REF  10  LAST  865          32,3107   15543 1           STODL   VCV
 3931   REF   6  LAST  855          32,3110   03716 1                   T1
 3932   REF  11  LAST  865          32,3111   15517 0           STODL   TET
 3933   REF   6  LAST  865          32,3112   03736 0                   T2
 3934   REF  45  LAST  855          32,3113   00041 1  RTENCK3D STORE   TDEC1
 3935                                32,3114   45014 0           CLEAR   CALL
```

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3936  REF  11  LAST  502   32,3115   00263 0          MOONFLAG
3937  REF   6  LAST  501   32,3116   27066 1          INTEGRVS
3938                       32,3117   77775 1  VLOAD
3939  REF  34  LAST  855   32,3120   00001 0          RATT
3950  REF  12  LAST  865   32,3121   03656 1  STORE   R(T2)/
3951                       32,3122   70125 0  PDDL    LXC,1
3952  REF   8  LAST  855   32,3123   00015 0          TAT
3953  REF   5  LAST  860   32,3124   03734 1          CONICX1
3954  REF   7  LAST  865   32,3125   27736 0  STOVL   T2
3955  REF  23  LAST  855   32,3126   00007 0          VATT
3956  REF  10  LAST  865   32,3127   03710 1  STORE   V(T2)/
3957                       32,3130   77650 1  GOTO
3958  REF  11  LAST  865   32,3131   03733 0          RTENCKEX
```

P4000 V2(T1) COMPUTATION SUBROUTINE

R4001 DESCRIPTION
R4002 A POST IMPULSE VELOCITY VECTOR (V2(T1)) IS COMPUTED WHICH EITHER
R4003 (1) MEETS THE INPUT VELOCITY CHANGE DESIRED (RTEDVD) IN A MINIMUM TIME OR
R4005 (2) IF A VELOCITY CHANGE ISN:T SPECIFIED (RTEDVD) = 0), A V2(T1) IS COMPUTED WHICH MINIMIZES THE IMPULSE (DV)
R4007 AND CONSEQUENTLY FUEL.

R4008 CALLING SEQUENCE
R4009 L CALL
R4010 L+1 V2T100

R4011 NORMAL EXIT MODE
R4012 AT L+2 OF CALLING SEQUENCE WITH MPAC = 0

R4013 ALARM EXIT MODE
R4014 AT L+2 OF CALLING SEQUENCE WITH MPAC = OCTAL 605 FOR EXCESS ITERATIONS

R4015 SUBROUTINES CALLED
R4016 GAMDV10
R4017 X11LIM
R4018 DVCALC

R4019 ERASABLE INITIALIZATION REQUIRED
R4020 FLSHLIST
R4021 NONE
R4022 MPAC
R4023 NONE
R4024 OTHER

R4025 R(T1)	MAGNITUDE OF INITIAL POSITION VECTOR	DP	B29/B27	METERS
R4027 RCON	MAGNITUDE OF FINAL POSITION VECTOR	DP	B29/B27	METERS
R4029 V(T1)/	INITIAL VELOCITY VECTOR	VECTOR	B7/B5	METERS/CS
R4031 RTEDVD	DELTA VELOCITY DESIRED	DP	B7/B5	METERS/CS
R4033 UR1/	UNIT INITIAL VECTOR	VECTOR	B1	
R4035 UH/	UNIT HORIZONTAL VECTOR	VECTOR	B1	
R4037 X(T2)	COTANGENT OF FINAL FLIGHT PATH ANGLE	DP	B0	
R4039 X(T1)	COTANGENT OF INITIAL FLIGHT PATH ANGLE(INPUT FOR PREC)	DP	B5	
R4041 CFPA	COSINE OF INITIAL FLIGHT PATH ANGLE	DP	B1	
R4043 MAMAX1	MAJOR AXIS LIMIT FOR LOWER BOUND ON GAMDV ITERATOR	DP	B30/B28	METERS
R4045 MAMAX2	MAJOR AXIS LIMIT FOR UPPER BOUND ON GAMDV ITERATOR	DP	B30/B28	METERS
R4049 PHI2	REENTRY NEAR PERIGEE OR APOGEE INDICATE (RTE ONLY)	DP	B2	-1 PERIGEE,+1 APOGEE
R4051 N1	CONIC OR PRECISION ITERATION COUNTER	DP	B28	NEGATIVE CONIC,PLUS PREC

R4053
R4054 OUTPUT

R4055 V2(T1)/	POST IMPULSE INITIAL VELOCITY VECTOR	VECTOR	B7/B5	METERS/CS
R4057 DV	INITIAL VELOCITY CHANGE	DP	B7/B5	METERS/CS
R4059 X(T1)	COTANGENT OF INITIAL FLIGHT PATH ANGLE (POST IMPULSE)	DP	B5	
R4061 PCON	SEMI-LATUS RECTUM	DP	B28/B26	METERS
R4063 BETA1	1+X(T2)**2	DP	B1	

R4067

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R4068   DEERIS
R4069     PUSHLIST
R4070       OCD         X(T1),,=PREVIOUS PRECISION X(T1)                    DP      B5
R4074       02D         THETA1=BETA5*LAMBDA-1                               TP      B17
R4076       04D         THETA2=2*R(T1)*(LAMBDA-1)                           TP      B38/B36
R4078       06D         THETA3=MU**.5/R(T1)                                 DP      B-4/B-5
R4080       10D         X(T1)MIN=LOWER BOUND ON X(T1) IN GAMDV ITERATOR     DP      B5
R4082       12D         DX(T1)MAX=MAXIMUM DELTA X(T1)                       DP      B5
R4084       14D         X(T1)MAX=UPPER BOUND ON X(T1) IN GAMDV ITERATOR     DP      B5
R4086       16D         DX(T1)=ITERATOR INCREMENT                           DP      B5
R4088       31D         GAMDV10 SUBROUTINE RETURN ADDRESS
R4089       32D         DVCALC SUBROUTINE RETURN ADDRESS
R4090       33D         V2T100 SUBROUTINE RETURN ADDRESS

 4100                           32,3132  77620 0  V2T100   STQ
 4101                           32,3133  00041 1                33D
 4104                           32,3134  43001 1           SETPD  CLEAR                                          PLOOD
 4105                           32,3135  00001 0                  0
 4106   REF   1                 32,3136  00272 0                  F2RTE
 4107                           32,3137  60345 0           DLOAD  NORM
 4108   REF  11  LAST  862      32,3140  03636 1                  RCON
 4109   REF  42  LAST  862      32,3141  00047 1                  X1
 4110                           32,3142  60325 0           PDDL   NORM
 4111   REF   5  LAST  856      32,3143  03646 0                  R(T1)
 4112   REF  33  LAST  833      32,3144  00051 0                  S1
 4113                           32,3145  00013 0           STORE  10D
 4114                           32,3146  56342 1           SR1    DDV      R1/RCON = LAMBDA                    B1
 4115                           32,3147  65260 0           XSU,1  PDDL                                           PLO2D
 4116   REF  34  LAST  868      32,3150  00050 1                  S1
 4117   REF  12  LAST  862      32,3151  03726 1                  X(T2)
 4118                           32,3152  77716 1           DSQ
 4120                           32,3153  43342 0           SR1    DAD
 4121   REF   5  LAST  861      32,3154  31655 0                  1RTEB1
 4122   REF   4  LAST  859      32,3155  03754 1           STORE  BETA1    1+X(T2)**2 = BETA1                  B1
 4123                           32,3156  77605 1           DMP
 4124                           32,3157  00001 0                  00D
 41245                          32,3160  00035 1           STORE  28D      BETA1*LAMBDA = BETA5
 41246                          32,3161  53605 1           DMP    SL*
 412461                         32,3162  00001 0                  00D
 412462                         32,3163  20172 1                  0 -7,1
 4125                           32,3164  45257 0           SL*    DSU
 4126                           32,3165  20172 1                  0 -7,1
 4127   REF   1                 32,3166  31673 1                  1RTEB17
 4128                           32,3167  65234 1           RTB    PDDL     BETA5*LAMBDA-1 = THETA1             B17 PLO5D
 41282  REF   2  LAST  615      32,3170  45562 1                  TPMODE
 41285  REF   6  LAST  868      32,3171  31655 0                  1RTEB1
 41287                          32,3172  57457 0           SR*    DCOMP
 4129                           32,3173  20601 1                  0,1
 41295                          32,3174  41215 1           DAD    DMP
 4130                           32,3175  00001 0                  00D
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413C2  REF   6  LAST  868   32,3176  03646 0          R(T1)
41305                      32,3177  47057 C    SL*    RTB
41307                      32,3200  20172 1           0 -7D,1
4131   REF   3  LAST  868   32,3201  45562 1           TPMODE
4132                       32,3202  77725 1    PDDL                2*R(T1)*(LAMBDA-1)=THETA2  B38/B36 PL08D
4133   REF   1              32,3203  33770 1           RTMURTE
4134                       32,3204  70501 1    NORM   SR1
4135   REF  18  LAST  862   32,3205  00050 1           X2
4136                       32,3206  56264 1    XSU,2  DDV
4137   REF  35  LAST  868   32,3207  00050 1           S1
4138                       32,3210  00013 C           10D
4139                       32,3211  65257 1    SR*    PDDL                MU**.5/R(T1)=THETA3        B-4/B-5 PL10D
4140                       32,3212  57170 C           6,2
4141   REF   3  LAST  842   32,3213  03652 C           MAMAX1
4142                       32,3214  41406 C    PUSH   PUSH                MAMAX1=MA
4143                       32,3215  77624 1    CALL
4144   REF   1              32,3216  65747 C           XT1LIN
4145                       32,3217  41476 1    DCOMP  PUSH                X(T1)MIN                                B5 PL12D
4146                       32,3220  40476 C    DCOMP  SR4
4147                       32,3221  41525 C    PDDL   PUSH                DX(T1)MAX                               B5 PL14D
4148   REF   3  LAST  842   32,3222  03654 C           MAMAX2
4149                       32,3223  45006 C    PUSH   CALL
4150   REF   2  LAST  869   32,3224  65747 C           XT1LIN
4151                       32,3225  50125 1    PDDL   BMN                 X(T1)MAX                                B5 PL16D
4152   REF  1C  LAST  862   32,3226  03730 C           NN1A
4153   REF   1              32,3227  65232 1           V2T102
4154                       32,3230  77650 1                GOTO
4155   REF   1              32,3231  65244 C           V2T110

R4156  PROCEED HERE IF NOT PRECISION COMPUTATION

4158                       32,3232  77745 1    V2T102 DLOAD
4159   REF   5  LAST  841   32,3233  03632 C                      RTEDVD
4160                       32,3234  52054 1           BZE    GOTO
4161   REF   1              32,3235  65237 1                  V2T105
4162   REF   1              32,3236  65340 C                  V2T140
4163                       32,3237  50145 1    V2T105 DLOAD   BMN
4164   REF   3  LAST  856   32,3240  03757 1                  CFPA
4165   REF   2  LAST  869   32,3241  65340 C                  V2T140
4166                       32,3242  77650 1           GOTO
4167   REF   1              32,3243  65346 C                  V2T145

R4168  DURING A PRECISION TRAJECTORY ITERATION CONSTRAIN THE INDEPENDENT
R4169  VARIABLE TO INSURE THAT ALL CONICS PASS THROUGH RCON ON THE SAME PASS
R4170  THROUGH X(T2)

4171                       32,3244  47145 1    V2T110 DLOAD   RTB
4172   REF   2  LAST  868   32,3245  31673 1           1RTE817
4173   REF   4  LAST  869   32,3246  45562 1           TPMODE
4174                       32,3247  65276 1    DCOMP  PDDL                -1                                      B17 PL19D
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4175  REF  4  LAST  861   32,3250  31717 1            2RTEB1
4176                      32,3251  45257 C      SR*   DSU
41765                     32,3252  20601 1            0,1
4177                      32,3253  00001 C            00D
41775                     32,3254  53605 1      DMP   SL*
4178                      32,3255  00035 1            28D
41785                     32,3256  20172 1            0 -7,1
4179                      32,3257  76257 C      SL*   TAD
41795                     32,3260  20172 1            0 -7,1
4180                      32,3261  65234 1      RTB   PDDL     BETA5(2-LAMBDA)-1=BETA6     B17 PL19D
4181  REF  5  LAST  869   32,3262  45562 1            TPMODE
4182  REF  2  LAST  124   32,3263  03722 C            X(T1)
4183                      32,3264  00001 0      STORE 00D      X(T1),,                     B5
4184                      32,3265  77751 1      TLOAD                                         PL16D
4185                      32,3266  53040 C      BMN   BZE
4186  REF  1              32,3267  65274 C            V2T115
41865 REF  2  LAST  87C   32,3270  65274 C            V2T115
4187                      32,3271  52061 1      SL    GOTO
4188                      32,3272  20210 C            7
4189  REF  1              32,3273  65305 1            V2T120
4190                      32,3274  50145 1 V2T115 DLOAD BMN
4191  REF  4  LAST  859   32,3275  03761 1            PHI2
4192  REF  1              32,3276  65316 C            V2T125
4193                      32,3277  77676 C      DCOMP
4194  REF  5  LAST  87C   32,3300  17761 1      STODL PHI2
4195  REF  2  LAST  842   32,3301  31721 1            M9RTEB28
4196  REF 11  LAST  869   32,3302  03730 C      STORE NN1A
4197                      32,3303  77650 1      GOTO
4198  REF  2  LAST  87C   32,3304  65316 C            V2T125
4199                      32,3305  47166 C V2T120 SQRT  RTB
4200  REF  2  LAST  492   32,3306  45713 C            DPMODE
42005                     32,3307  50125 1      PDDL  BMN      BETA6**.5=X(T1)LIM          B5 PL18D
4201  REF  6  LAST  87C   32,3310  03761 1            PHI2
4202  REF  1              32,3311  65324 1            V2T130
4203                      32,3312  45545 1      DLOAD STADR                                   PL16D
4204                      32,3313  77760 C      STORE 14D      X(T1)LIM = X(T1)MAX
4205                      32,3314  77676 0      DCOMP
4206                      32,3315  00013 C      STORE 10D      -X(T1)LIM = X(T1)MIN
4207                      32,3316  53145 1 V2T125 DLOAD BZE
4208  REF  3  LAST  87C   32,3317  03722 C            X(T1)
4209  REF  3  LAST  869   32,3320  65340 0            V2T140
4210                      32,3321  52040 1      BMN   GOTO
4211  REF  4  LAST  87C   32,3322  65340 C            V2T140
4212  REF  2  LAST  869   32,3323  65346 C            V2T145
4213                      32,3324  53145 1 V2T130 DLOAD BZE
4214  REF  4  LAST  87C   32,3325  03722 C            X(T1)
4215  REF  1              32,3326  65335 1            V2T135
4216                      32,3327  71240 1      BMN   DLOAD                                   PL16D
4217  REF  2  LAST  87C   32,3330  65335 1            V2T135
4218                      32,3331  77626 C      STADR
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4219                          32,3332  77764 1          STORE  10D      X(T1)LIM = X(T1)MIN
4220                          32,3333  77650 1          GOTO
4221  REF  3  LAST  87C       32,3334  65346 C                 V2T145
4222                          32,3335  57545 1  V2T135  DLOAD  DCOMP                          PL16D
4223                          32,3336  77626 C          STADR
4224                          32,3337  77760 C          STORE  14D      -X(T1)LIM = X(T1)MAX
4225                          32,3340  77745 1  V2T140  DLOAD
4226                          32,3341  00013 C                 10D
4227  REF  5  LAST  87C       32,3342  17722 C          STODL  X(T1)    X(T1)MIN = X(T1)
4228                          32,3343  00015 C                 12D
4229                          32,3344  52006 C          PUSH   GOTO     DX(T1)MAX = DX(T1)     PL18D
4230  REF  1                  32,3345  65353 1                 V2T150
4231                          32,3346  77745 1  V2T145  DLOAD
4232                          32,3347  00017 1                 14D
4233  REF  6  LAST  871       32,3350  17722 C          STODL  X(T1)    X(T1)MAX = X(T1)
4234                          32,3351  00015 C                 12D
4235                          32,3352  41476 1          DCOMP  PUSH     -DX(T1)MAX = DX(T1)    PL18D
4236                          32,3353  77624 1  V2T150  CALL           GOTO X(T1)-DV ITERATOR
4237  REF  1                  32,3354  65474 C                 GAMDV10
4238                          32,3355  53145 1          DLOAD  BZE      EXIT IF MINIMUM FUEL MODE
4239  REF  6  LAST  869       32,3356  03632 C                 RTEDVD
4240  REF  1                  32,3357  65472 C                 V2T1X

R4241  CONTINUE IF TIME CRITICAL MODE

4242                          32,3360  50025 C          DSU    BMN
4243  REF  3  LAST  846       32,3361  03706 C                 DV
4244  REF  1                  32,3362  65365 1                 V2T155
4245                          32,3363  77650 1          GOTO
4246  REF  1                  32,3364  65420 1                 V2T175
4247                          32,3365  50145 1  V2T155  DLOAD  BMN
4248  REF  12  LAST  870      32,3366  03730 C                 NN1A
4249  REF  1                  32,3367  65372 1                 V2T160
4250                          32,3370  77650 1          GOTO
4251  REF  1                  32,3371  65433 C                 V2T185

R4252  CONIC TRAJECTORY COMPUTATION

4253                          32,3372  53145 1  V2T160  DLOAD  BZE
4254  REF  7  LAST  871       32,3373  03722 C                 X(T1)
4255  REF  1                  32,3374  65400 C                 V2T165
4256                          32,3375  52040 1          BMN    GOTO
4257  REF  2  LAST  871       32,3376  65400 C                 V2T165
4258  REF  1                  32,3377  65470 1                 V2T3CC
4259                          32,3400  53145 1  V2T165  DLOAD  BZE
4260  REF  4  LAST  869       32,3401  03757 1                 CFPA
4261  REF  2  LAST  871       32,3402  65470 1                 V2T3CC
4262                          32,3403  71240 1          BMN    DLOAD
4263  REF  3  LAST  871       32,3404  65470 1                 V2T3CC
4264                          32,3405  00017 1                 14D
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4265  REF   8  LAST  871   32,3406  17722 C          STODL  X(T1)          X(T1)MAX=X(T1)
4266                       32,3407  00015 C                 12D
4267                       32,3410  77676 C          DCOMP
4268                       32,3411  34021 C          STCALL 16D           -DX(T1)MAX=DX(T1)
4269  REF   2  LAST  871   32,3412  65474 C                 GAMDV10
4270                       32,3413  45345 1          DLOAD  DSU
4271  REF   7  LAST  871   32,3414  03632 C                 RTEDVD
4272  REF   4  LAST  871   32,3415  03706 C                 DV
4273                       32,3416  77640 C          BMN
4274  REF   4  LAST  871   32,3417  65470 1                 V2T300
4279                       32,3420  71214 C  V2T175  SET    DLOAD
4280  REF   2  LAST  868   32,3421  00072 1                 F2RTE
4281  REF   5  LAST  872   32,3422  03722 C                 X(T1)
4282                       32,3423  14017 1          STODL  14D           X(T1)=X(T1)MAX
4283                       32,3424  00015 C                 12D
4284                       32,3425  77676 C          DCOMP
4285                       32,3426  34021 C          STCALL 16D           -DX(T1)MAX=DX(T1)
4286  REF   3  LAST  872   32,3427  65474 C                 GAMDV10
4287                       32,3430  50145 1          DLOAD  BMN
42875 REF  13  LAST  871   32,3431  03730 C                 NN1A
4288  REF   5  LAST  872   32,3432  65470 1                 V2T300

R42885  PREVENT A LARGE CHANGE IN INDEPENDENT VARIABLE DURING AN ITERATION FOR A
R428851 PRECISION TRAJECTORY

4289                       32,3433  45345 1  V2T185  DLOAD  DSU
4290  REF  10  LAST  872   32,3434  03722 C                 X(T1)
4291                       32,3435  00001 C                 00D
4292                       32,3436  65246 1          ABS    PDDL          /X(T1)-X(T1),,/ = BETA7
4293                       32,3437  00015 C                 12D
4294                       32,3440  44352 C          SL1    BDSU
4295                       32,3441  71240 1          BMN    DLOAD
4296  REF   6  LAST  872   32,3442  65470 1                 V2T300
4297                       32,3443  00001 C                 00D           CONTINUE IF BETA7 LARGER THAN 2DX(T1)MAX
4298  REF  11  LAST  872   32,3444  03722 C          STORE  X(T1)          X(T1),, = X(T1)
4299                       32,3445  50025 C          DSU    BMN
4300                       32,3446  00017 1                 14D
4301  REF   1              32,3447  65455 C                 V2T195
4302                       32,3450  77745 1          DLOAD
4303                       32,3451  00017 1                 14D
4304  REF  12  LAST  872   32,3452  03722 C          STORE  X(T1)          X(T1)MAX = X(T1)
4305                       32,3453  77650 1          GOTO
4306  REF   1              32,3454  65466 C                 V2T205
4307                       32,3455  45345 1  V2T195  DLOAD  DSU
4308  REF  13  LAST  872   32,3456  03722 C                 X(T1)
4309                       32,3457  00013 C                 10D
4310                       32,3460  52040 1          BMN    GOTO
4311  REF   1              32,3461  65463 C                 V2T200
4312  REF   2  LAST  872   32,3462  65466 C                 V2T205
4313                       32,3463  77745 1  V2T200  DLOAD
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4314                          32,3464  00013 0                    10D
4315  REF  14  LAST  872      32,3465  03722 0          STORE     X(T1)        X(T1)MIN = X(T1)
4316                          32,3466  77624 1  V2T205  CALL
4317  REF  1                  32,3467  65673 0                    DVCALC
4318                          32,3470  77745 1  V2T300  DLOAD
4319  REF  5   LAST  863      32,3471  31701 0                    ZERORTE
4320                          32,3472  77650 1  V2T1X    GOTO
4321                          32,3473  00041 1                    33D
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L       P37,P70

P4400   X(T1)-CV ITERATOR SUBROUTINE

R4401   DESCRIPTION
R4402       COMPUTES A POST IMPULSE VELOCITY VECTOR (V2(T1)) WHICH REQUIRES A MINIMUM DV.
R4404   CALLING SEQUENCE
R4405     L       CALL
R4406     L+1             GAMCV10

R4407   NORMAL EXIT MODE
R4410     AT L+2 OF CALLING SEQUENCE

R4411   ALARM EXIT MODE
R4412     AT V211X WITH MPAC = OCTAL 605 FOR EXCESS ITERATIONS

R4413   SUBROUTINES CALLED
R4414     CVCALC

R4415   ERASABLE INITIALIZATION REQUIRED
R4416     PUSHLIST
R4417       C2D         THETA1=BETA5*LAMBDA-1                                   TP      B17
R4419       05D         THETA2=2*R(T1)*(LAMBDA-1)                               TP      B38/B36
R4421       08D         THETA3=MU**.5/R(T1)                                     DP      B-4/B-5
R4423       10D         X(T1)MIN=LOWER BOUND ON INDEPENDENT VARIABLE X(T1)      DP      B5
R4425       12D         DX(T1)MAX=MAXIMUM DX(T1)                                DP      B5
R4427       14D         X(T1)MAX=UPPER BOUND ON INDEPENDENT VARIABLE X(T1)      DP      B5
R4429       16D         DX(T1)=ITERATOR INCREMENT                               DP      B5
R4431     MPAC
R4432       NONE
R4433     OTHER
R4434       V(T1)/      INITIAL VELOCITY VECTOR                                 VECTOR  B7/B5   METERS/CS
R4436       RTEDVD      DELTA VELOCITY DESIRED                                  DP      B7/B5   METERS/CS
R4438       UR1/        UNIT INITIAL VECTOR                                     VECTOR  B1
R4440       UH/         UNIT HORIZONTAL VECTOR                                  VECTOR  B1
R4442       X(T1)       COTANGENT OF INITIAL FLIGHT PATH ANGLE (FROM VERTICAL)  DP      B5
R4444       F2RTE       TIME CRITICAL OR MINIMUM FUEL MODE INDICATOR            STATE AREA      0 MIN. FUEL, 1 MIN. TIME
R4446
R4447   OUTPUT
R4448       V2(T1)/     POST IMPULSE INITIAL VELOCITY VECTOR                    VECTOR  B7/B5   METERS/CS
R4450       DV          INITIAL VELOCITY CHANGE                                 DP      B7/B5   METERS/CS
R4452       X(T1)       COTANGENT OF INITIAL FPA MEASURED FROM VERTICAL         DP      B5
R4454       PCDA        SEMI-LATUS RECTUM                                       DP      B28/B26 METERS
R4456
R4457   DEBRIS
R4458     PUSHLIST
R4459       CCD         X(T1),,
R4462       02D         THETA1
R4463       05D         THETA2
R4464       08D         THETA3
R4465       10D         X(T1)MIN
R4466       12D         DX(T1)MAX
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R4467   14D     X(T1)MAX
R4468   16D     DX(T1)
R4473   22D     DV,=PREVIOUS DV                                  DP      87/85
R4475   24D     BETA9=X(T1)+1.1DX(T1)                            DP      85
R4477   31D     GAMDV10 SUBROUTINE RETURN ADDRESS
R4478   32D     DVCALC SUBROUTINE RETURN ADDRESS
R4479   33D     V2T100 SUBROUTINE RETURN ADDRESS
 4490                   32,3474  77620 0  GAMDV10  STQ
 4491                   32,3475  00037 0           31D
 4500                   32,3476  45001 1  SETPD    CALL
 4501                   32,3477  00023 0           18D                                          PL18D
 4502  REF  2 LAST 873  32,3500  65673 0           DVCALC
 4503                   32,3501  45345 1  DLOAD    DSU
 4504                   32,3502  00017 1           14D
 4505                   32,3503  00013 0           10D
 4506                   32,3504  77600 1  BOV
 4507  REF  1           32,3505  65525 0           GAMDV20
 4508                   32,3506  45206 1  PUSH     DSU      X(T1)MAX-X(T1)MIN=BETA8             B5 PL20D
 4509  REF  1           32,3507  31774 1           EPC9RTE
 4510                   32,3510  71240 1  BMN      DLOAD
 4511  REF  1           32,3511  65671 1           GAMDVX   BOUNDS CLOSE TOGETHER
 4512                   32,3512  00023 0           18D
 4513                   32,3513  50025 0  DSU      BMN      BETA8-DX(T1)MAX
 4514                   32,3514  00015 0           12D
 4515  REF  1           32,3515  65521 1           GAMDV15
 4516                   32,3516  52001 1           SETPD    GOTO                                 PL18D
 4517                   32,3517  00023 0           18D
45175  REF  2 LAST 875  32,3520  65525 0           GAMDV20
 4518                   32,3521  77745 1  GAMDV15  DLOAD                                        PL18D
 4519                   32,3522  70565 0           SIGN     SR1
 4520                   32,3523  00021 1           16D
 4521                   32,3524  00021 1           STORE    16D      BETA8(SIGNDX(T1))/2=DX(T1)
 4522                   32,3525  77745 1  GAMDV20  DLOAD
 4523  REF  1           32,3526  31703 1           M144RTE
 4524  REF  6 LAST 86C  32,3527  03732 1           STORE    NN2
 4525                   32,3530  43345 1  GAMDV25  DLOAD    DAD
 4526  REF  7 LAST 875  32,3531  03732 1           NN2
 4527  REF  4 LAST 862  32,3532  31677 0           1RTEB28
 4528                   32,3533  67240 0           BMN      SLOAD
 4529  REF  1           32,3534  65540 0           GAMDV30
 4530  REF  3 LAST 859  32,3535  31737 0           OCT605
 4531                   32,3536  77650 1           GOTO
 4532  REF  2 LAST 871  32,3537  65472 0           V2T1X
 4533  REF  8 LAST 879  32,3540  03732 1  GAMDV30  STORE    NN2      NN2=NN2+1
 4534                   32,3541  65345 0           DLOAD    PDDL     X(T1)=X(T1),                B5 PL20D
 4535  REF 15 LAST 873  32,3542  03722 0           X(T1)
 4536  REF  5 LAST 872  32,3543  03706 0           DV
 4537                   32,3544  43325 1           PDDL     DAD      DV=DV,                      B7/B5 PL22D
 4538  REF 16 LAST 875  32,3545  03722 0           X(T1)
 4539                   32,3546  00021 1           16D
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4540   REF  17  LAST  875   32,3547  37722 1            STCALL X(T1)          X(T1)+DX(T1)=X(T1)                    B5
4541   REF   3  LAST  875   32,3550  65673 C                   DVCALC
4542                        32,3551  71214 C            BON    DLOAD
4543   REF   3  LAST  872   32,3552  00312 1                   F2RTE
4544   REF   1               32,3553  65567 C                   GAMDV35
4545   REF   6  LAST  875   32,3554  03706 C                   DV
4546                        32,3555  50025 C            DSU    BMN           CONTINUE IF FUEL CRITICAL MODE
4547                        32,3556  00025 C                   20D
4548   REF   1               32,3557  65564 C                   GAMDV33
4549                        32,3560  57545 1  GAMDV32   DLOAD  DCOMP
4550                        32,3561  00021 1                   16D
4551                        32,3562  77742 C            SR1
4552                        32,3563  00021 1            STORE  16D
4553                        32,3564  52001 1  GAMDV33   SETPD  GOTO
4554                        32,3565  00023 C                   18D                                          PL18D
4555   REF   1               32,3566  65630 1                   GAMDV50

R4556  TIME CRITICAL MODE

4557                        32,3567  45345 1  GAMDV35   DLOAD  DSU
4558   REF   8  LAST  872   32,3570  03632 C                   RTEDVD
4559   REF   7  LAST  876   32,3571  03706 C                   DV
4560                        32,3572  41525 C            PDDL   PUSH          DVD-DV=DVERR                          B7/B5 PL22D
4561                        32,3573  51545 1  GAMDV40   DLOAD  ABS           DV,                                   PL24D
4562                        32,3574  00025 C                   20D
4563                        32,3575  50025 C            DSU    BMN
4564   REF   1               32,3576  31776 C                   EPC1ORTE
4565   REF   2  LAST  875   32,3577  65671 1                   GAMDVX
4566                        32,3600  77745 1  GAMDV45   DLOAD                                                      PL22D
4567                        32,3601  60221 C            BDSU   NORM
4568   REF   8  LAST  876   32,3602  03706 C                   DV
4569   REF  19  LAST  869   32,3603  00050 1                   X2
4570                        32,3604  77725 1            PDDL                 DV-DV,                        B7/B5-N2 PL22D
4571                        32,3605  70501 1            NORM   SR1           DVERR                         B8/B6-N1
4572   REF  43  LAST  868   32,3606  00047 1                   X1
4573                        32,3607  77671 1            DDV
4574                        32,3610  65200 C            BOV    PDDL          DVERR/(DV-DV,)                        PL20D
4575   REF   1               32,3611  65624 1                   GAMDV47
4576                        32,3612  41221 C            BDSU   DMP                                                   PL18D
4577   REF  18  LAST  876   32,3613  03722 C                   X(T1)
4578                        32,3614  53660 1            XSU,1  SR*
4579   REF  20  LAST  876   32,3615  00047 1                   X2
4580                        32,3616  20600 C                   0 -1,1
4581                        32,3617  00021 1            STORE  16D           (X(T1)-X(T1),)DVERR/(DV-DV,)=DX(T1)
4582                        32,3620  45246 C            ABS    DSU
4583                        32,3621  00015 C                   12D
4584                        32,3622  77640 C            BMN
4585   REF   2  LAST  876   32,3623  65630 1                   GAMDV50
4586                        32,3624  75345 1  GAMDV47   DLOAD  SIGN
4587                        32,3625  00015 C                   12D
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4588                          32,3626  00021 1                 16D
4589                          32,3627  00021 1          STORE  16D      DX(T1)MAX(SIGNDX(T1))=DX(T1)

R4590  CHECK TO KEEP INDEPENDENT VARIABLE IN BOUNDS

4591                          32,3630  41345 0  GAMDV50 DLOAD  DMP
4592                          32,3631  00021 1                 16D
4593  REF  1                  32,3632  31713 0                 1.1RTEB1
4594                          32,3633  43352 1          SL1    DAD
4595  REF  19 LAST 876        32,3634  03722 0                 X(T1)
4596                          32,3635  00031 0          STORE  24D      X(T1)+1.1DX(T1)=BETA9          B5
4597                          32,3636  50025 0          DSU    BMN
4598                          32,3637  00017 1                 14D
4599  REF  1                  32,3640  65647 1                 GAMDV55
4600                          32,3641  45345 1          DLOAD  DSU
4601                          32,3642  00017 1                 14D
4602  REF  20 LAST 877        32,3643  03722 0                 X(T1)
4603                          32,3644  77742 0          SR1
4604                          32,3645  34021 0          STCALL 16D      (X(T1)MAX-X(T1))/2=DX(T1)      B5
4605  REF  1                  32,3646  65662 0                 'GAMDV65
4606                          32,3647  45345 1  GAMDV55 DLOAD  DSU
4607                          32,3650  00031 0                 24D
4608                          32,3651  00013 0                 10D
4609                          32,3652  52040 1          BMN    GOTO
4610  REF  1                  32,3653  65655 1                 GAMDV60
4611  REF  2 LAST 877         32,3654  65662 0                 GAMDV65
4612                          32,3655  45345 1  GAMDV60 DLOAD  DSU
4613                          32,3656  00013 0                 10D
4614  REF  21 LAST 877        32,3657  03722 0                 X(T1)
4615                          32,3660  77742 0          SR1
4616                          32,3661  00021 1          STORE  16D      (X(T1)MIN-X(T1))/2=DX(T1)      B5
4617                          32,3662  51545 1  GAMDV65 DLOAD  ABS
4618                          32,3663  00021 1                 16D
4619                          32,3664  50025 0          DSU    BMN
4620  REF  2 LAST 875         32,3665  31774 1                 EPC9RTE
4621  REF  3 LAST 876         32,3666  65671 1                 GAMDVX
4622                          32,3667  77650 1          GOTO
4623  REF  1                  32,3670  65530 1                 GAMDV25
4624                          32,3671  77650 1  GAMDVX GOTO
4625                          32,3672  00037 0                 31D
```

```
P4700   DV CALCULATION SUBROUTINE

R4701   INPUT
R4702     PUSHLIST
R4703       D2D         THETA1=BETA5*LAMBDA-1                                  TP      B17
R4705       D5D         THETA2=2*R(T1)*(LAMBDA-1)                              TP      B38/B36
R4707       D8D         THETA3=MU**.5/R(T1)                                    DP      B-4/B-5
R4709     OTHER
R4710       X(T1)       COTANGENT OF POST IMPULSE INITIAL FLIGHT PATH ANGLE    DP      B5
R4712       V(T1)/      INITIAL VELOCITY VECTOR (PRE IMPULSE)                  VECTOR  B7/B5   METERS/CS
R4714       UR1/        UNIT INITIAL VECTOR                                    VECTOR  B1
R4716       UH/         UNIT HORIZONTAL VECTOR                                 VECTOR  B1
R4718
R4719   OUTPUT
R4720       V2(T1)/     POST IMPULSE INITIAL VELOCITY VECTOR                   VECTOR  B7/B5   METERS/CS
R4722       DV          INITIAL VELOCITY CHANGE                                DP      B7/B5   METERS/CS
R4724       PCON        SEMI-LATUS RECTUM                                      DP      B28/B26 METERS
R4726
R4727   DEBRIS
R4728       28D         THETA3*PCON**.5                                        DP      B10/B8-N1
R4730       C(PUSLOC)   THETA3(PCON**.5)*X(T1)*UR1/                            VECTOR  B7/B5
R4732       32D         DVCALC SUBROUTINE RETURN ADDRESS
R4733       X1          NORMALIZATION FACTOR FOR VALUE IN 28D
R4734   PUSHLOC IS RESTORED TO ITS ENTRANCE VALUE UPON EXITING DVCALC

 4750                           32,3673  71220 1  DVCALC  STQ     DLOAD
 4751                           32,3674  00040 0          32D
 4752  REF  22  LAST  877       32,3675  03722 0          X(T1)
 4753                           32,3676  54316 1          DSQ     SR
 4754                           32,3677  20610 1          7
 4755                           32,3700  76276 0          DCOMP   TAD
 4756                           32,3701  00003 1          02D
 4757                           32,3702  41501 0          NORM    PUSH
 4758  REF  44  LAST  876       32,3703  00047 1          X1
 4759                           32,3704  60351 0          TLOAD   NORM
 4760                           32,3705  00006 1          05D
 4761  REF  21  LAST  876       32,3706  00050 1          X2
 4762                           32,3707  70434 0          RTB     SR1
47625  REF   3  LAST  870       32,3710  45713 0          DPMODE
476251                         32,3711  56264 1          XSU,2   DDV
 4763  REF  45  LAST  878       32,3712  00046 0          X1
47635                          32,3713  77657 0          SR*
476351                         32,3714  57170 0          6,2
 4764  REF   3  LAST  844       32,3715  03720 1          STORE   PCON    THETA2/(THETA1-X(T1)**2)=PCON B28/26
 4765                           32,3716  41366 1          SQRT    DMP
 4766                           32,3717  00011 1          08D
 4767                           32,3720  77701 1          NORM
 4768  REF  46  LAST  878       32,3721  00047 1          X1
 4769                           32,3722  14035 1          STODL   28D     THETA3*PCON**.5         B10/B8 -N1
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4770  REF  23  LAST  878   32,3723   03722 C            X(T1)
4771                       32,3724   74301 C   NORM     VXSC
4772  REF  22  LAST  878   32,3725   00050 1            X2
4773  REF   8  LAST  856   32,3726   03740 1            UR1/          X(T1)*UR1/                B5+B1 -N2
4774                       32,3727   74274 C   XAD,2    VXSC
4775  REF  47  LAST  878   32,3730   00046 C            X1
4776                       32,3731   00035 1            28D
4777                       32,3732   63257 1   VSR*     PDVL          THETA3(PCON**.5)X(T1)*UR1/ B7/B5
4778                       32,3733   57207 C            0 -9D,2                  +
4779  REF   5  LAST  856   32,3734   03746 1            UH/
4780                       32,3735   53761 1   VXSC     VSR*          THETA3(PCON**.5)UH/       B7/B5
4781                       32,3736   00035 1            28D
4782                       32,3737   20575 1            0 -4,1                   =
4783                       32,3740   45455 1   VAD      STADR
4784  REF   7  LAST  865   32,3741   74077 1   STORE    V2(T1)/       V2(T1)/                   B7/B5
4785                       32,3742   51451 C   VSU      ABVAL
4786  REF   6  LAST  856   32,3743   03672 1            V(T1)/
4787  REF   9  LAST  876   32,3744   03706 C   STORE    DV            ABVAL(V2(T1)/-V1(T)/)=DV  B7/B5
4788                       32,3745   77650 1   GOTO
4789                       32,3746   00040 C            32D
```

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P4800   SUBROUTINE TO COMPUTE BOUNDS ON INDEPENDENT VARIABLE X(T1)

R4801   INPUT
R4802     PUSHLIST
R4803       PUSHLOC -4  MAJOR AXIS (MA)                          DP      B30/B28
R4805       PUSHLOC -2  MAJOR AXIS (MA) AGAIN                    DP      B30/B28
R4807       28D         BETA5=LAMBDA*BETA1                       DP      B9
R4809     OTHER
R4810       RCON                                                 DP      B29/B27
R4812       R(T1)                                                DP      B29/B27
R4814   OUTPUT
R4815     MPAC
R4816       X(T1)LIM    LIMIT ON INDEPENDENT VARIABLE X(T1)      DP      B5
R4818   DEBRIS
R4819     PUSHLIST
R4820       C(PUSHLOC)  MA-RCON                                  DP      (B30/28)-N1
R4823       C(PSHLOC)+2 MA                                       DP      B30/B28
R4825       X1          NORMALIZATION FACTOR FOR MA-RCON
R4826       20D         XT1LIM SUBROUTINE RETURN ADDRESS
R4827   PUSHLOC IS RESTORED TO ITS ENTRANCE VALUE UPON EXITING XT1LIM

 4850                   32,3747  71220 1  XT1LIM   STQ     DLOAD
 4851                   32,3750  00024 1           20D
 4852   REF  12 LAST 868 32,3751  03636 1           RCON
 4853                   32,3752  44342 1           SR1     BDSU
 4854                   32,3753  65301 0           NORM    PDDL
 4855   REF  23 LAST 879 32,3754  00050 1           X2
 4856                   32,3755  70525 1           PDDL    SR1
 4857   REF   7 LAST 869 32,3756  03646 0           R(T1)
 4858                   32,3757  56221 0           BDSU    DDV
 4859                   32,3760  41257 1           SL*     DMP
 4860                   32,3761  57577 0                   0 -1,2
 4861                   32,3762  00035 1                   28D
 48615                  32,3763  77657 0           SL*
 486151                 32,3764  20172 1                   0 -7,1
 4862                   32,3765  50025 0           DSU     BMN
 4863   REF   1         32,3766  31665 0                   1RTEB10
 4864   REF   1         32,3767  65772 0                   XT1LIM5
 4865                   32,3770  52166 1           SQRT    GOTO
 4866   REF   1         32,3771  65774 0                   XT1LIMX
 4867                   32,3772  77745 1  XT1LIM5  DLOAD
 4868   REF   6 LAST 873 32,3773  31701 0                   ZERORTE
 4869                   32,3774  77650 1  XT1LIMX  GOTO
 4870                   32,3775  00024 1                   20D
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P4900 CONSTANTS FOR THE P37 AND P70 PROGRAMS AND SUBROUTINES

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49005                   36,3250                         BANK    36
49006  REF    1         34,2000                         SETLOC  RTECON
49007                   34,3654                         BANK

4901                    34,3654   20000 0   1RTEB1    2DEC    1.B-1
4901                    34,3655   00000 1
4902                    34,3656   10000 0   1RTEB2    2DEC    1.B-2
4902                    34,3657   00000 1
4903                    34,3660   04000 0   1RTEB3    2DEC    1.B-3
4903                    34,3661   00000 1
4904                    34,3662   02000 0   1RTEB4    2DEC    1.B-4
4904                    34,3663   00000 1
4910                    34,3664   00020 0   1RTEB10   2DEC    1.B-10
4910                    34,3665   00000 1
4912                    34,3666   00004 0   1RTEB12   2DEC    1.B-12
4912                    34,3667   00000 1
4913                    34,3670   00002 0   1RTEB13   2DEC    1.B-13
4913                    34,3671   00000 1
4917                    34,3672   00000 1   1RTEB17   2DEC    1.B-17
4917                    34,3673   04000 0
4925                    34,3674   00000 1   1RTEB25   2DEC    1.B-25
4925                    34,3675   00010 0
4928                    34,3676   00000 1   1RTEB28   2DEC    1.B-28
4928                    34,3677   00001 0
4929                    34,3700   00000 1   ZERORTE   2DEC    0
4929                    34,3701   00000 1
4930                    34,3702   77777 0   M144RTE   2DEC    -144.B-28
4930                    34,3703   77557 0
49301                   34,3704   77777 0   M15RTE    2DEC    -15
49301                   34,3705   77760 0
49302                   34,3706   00000 1   10RTE     2DEC    10
49302                   34,3707   00012 1
49303                   34,3710   54631 1   M.6RTE    2DEC    -.6
49303                   34,3711   63145 1
4931                    34,3712   21463 0   1.1RTEB1  2DEC    1.1B-1
4931                    34,3713   06315 0
49311                   34,3714   77777 0   M6RTEB28  2DEC    -6
49311                   34,3715   77771 0
49312                   34,3716   37777 1   2RTEB1    2OCT    3777737777
49312                   34,3717   37777 1
4932                    34,3720   77777 0   M9RTEB28  2DEC    -9
4932                    34,3721   77766 0
4933                    34,3722   77777 0   M8RTEB28  2DEC    -8
4933                    34,3723   77767 1
4934                    34,3724   00000 1   30480RTE  2DEC    30480.B-29
4934                    34,3725   35610 0
4935                    34,3726   36703 0   VCSPS     2DEC    30.88118-5
4935                    34,3727   03743 1
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4936                    34,3730  33041 1  VCRCS    2DEC   27.06648-5
4936                    34,3731  37714 1
4937                    34,3732  00003 1  MDOTRCS  2DEC   .00163758-3
4937                    34,3733  13241 1
4938                    34,3734  20000 0  CSUBT    2DEC   .5
4938                    34,3735  00000 1
4940                    34,3736  00605 1  OCT605   OCT    00605
4941                    34,3737  00612 1  OCT612   OCT    00612
4942                    34,3740  00613 0  OCT613   OCT    00613
4943                    34,3741  40214 1  MCOS7.5  2DEC   -.99144486
4943                    34,3742  45266 1
4944                    34,3743  73645 1  MSIN7.5  2DEC   -.13052619
4944                    34,3744  56536 1
4945                    34,3745  70467 0  MCOS22.5 2DEC   -.923879538-2
4945                    34,3746  71205 0
4946                    34,3747  16525 1  THETA165 2DEC   .458333333
4946                    34,3750  12525 0
4947                    34,3751  22525 0  THETA210 2DEC   .583333333
4947                    34,3752  12525 0
4951                    34,3753  17775 1  EPC1RTE  2DEC   .99966B-1
4951                    34,3754  06676 0
4952                    34,3755  00000 1  EPC2RTE  2DEC   100.B-29
4952                    34,3756  00062 0
4953                    34,3757  00020 0  EPC3RTE  2DEC   .001
4953                    34,3760  14223 1
4954                    34,3761  00000 1  EPC4RTE  2DEC   .00001
4954                    34,3762  05174 0
4955                    34,3763  00002 0  EPC5RTE  2DEC   .01B-6
4955                    34,3764  21727 0
4956                    34,3765  00000 1  EPC6RTE  2DEC   .0000078-1
4956                    34,3766  01654 1
4957                    34,3767  00000 1  EPC7RTE  2DEC   1000.B-29
4957                    34,3770  00764 1
4958                    34,3771  00040 0  EPC8RTE  2DEC   .002
4958                    34,3772  30447 0
4959                    34,3773  00000 1  EPC9RTE  2DEC   1.B-25
4959                    34,3774  00010 0
4960                    34,3775  00000 1  EPC10RTE 2DEC   .0001B-7
4960                    34,3776  00322 1
4961                    35,3755                   BANK   35
4962  REF   1           35,2000                   SETLOC RTECCN1
4963                    35,3755                   BANK
4964                    35,3755  27657 0  C4RTE    2DEC   8.E8B-30
4964                    35,3756  01000 0
4971                    35,3757  00325 0  K1RTE    2DEC   7.E6B-29
4971                    35,3760  23740 0
4972                    35,3761  00306 1  K2RTE    2DEC   6495000.B-29
4972                    35,3762  06614 1
4973                    35,3763  76027 0  K3RTE    2DEC   -.06105
4973                    35,3764  70156 1
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4974                35,3765   74517 1  K4RTE    2DEC   -.10453
4974                35,3766   54131 0
4980                35,3767   30276 1  RTMURTE  2DEC   199650.5018-18
4980                35,3770   05001 0
4995                35,3771   00003 1  E3RTE    2DEC   121920.B-29
4995                35,3772   27040 0
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2000                              23,3140                    BANK   23
2001   REF   1                    42,2000                    SETLOC SBAND
2002                              42,3565                    BANK

2003   REF   1                                               COUNT* $$/R05
2004   REF   3  LAST  759  E4,1417                           EBANK= EMSALT

20061  REF 23E  LAST  850  42,3565  0 4555 C  SBANDANT TC     BANKCALL   V 64 E GETS US HERE
20062  REF   8  LAST  754  42,3566   17573 C             CADR   R02BCTH    CHECK IF IMU IS ON AND ALIGNED
2007   REF 222  LAST  850  42,3567  0 6006 1             TC     INTPRET
2008                       42,3570   45034 1             RTB    CALL
2009   REF  24  LAST  741  42,3571   45505 C                    LOADTIME   PICKUP CURRENT TIME SCALED B-28
2010   REF   9  LAST  728  42,3572   47432 1                    CDUTRIG    COMPUTE SINES AND COSINES OF CDU ANGLES
2012   REF  46  LAST  865  42,3573   34041 C             STCALL TDEC1      ADVANCE INTEGRATION TO TIME IN TDEC1
2013   REF   9  LAST  731  42,3574   27045 C                    CSMCONIC   USING CONIC INTEGRATION
2014                       42,3575   46135 1             SLOAD  BHIZ       ORIGIN OF REFERENCE INERTIAL SYSTEM IS
2015   REF  24  LAST  880  42,3576   00050 1                    X2         EARTH = 0, MOON = 2
2016   REF   1             42,3577   65612 1                    EISGI
2017                       42,3600   77775 1             VLOAD
2018   REF  35  LAST  866  42,3601   00001 C                    RATT
2019   REF   1             42,3602   00003 1             STORE  RCM        MOVE RATT TO PREVENT WIPEOUT
2020                       42,3603   45145 C             DLOAD  CALL       MOON, PUSH ON
2021   REF   9  LAST  866  42,3604   00015 C                    TAT        GET ORIGINAL TIME
2022   REF   1             42,3605   54115 C                    LUNPOS     COMPUTE POSITION VECTOR OF MOON
2023                       42,3606   57455 1             VAD    VCOMP      R= -(REM+RCM) = NEG. OF S/C POS. VEC
2024   REF   2  LAST  884  42,3607   00003 1                    RCM
2025                       42,3610   77650 1             GOTO
2026   REF   2  LAST  884  42,3611   65614 1                    EISOI +2
2027                       42,3612   57575 1  EISOI      VLOAD  VCOMP      EARTH, R= -RCM
2028   REF  36  LAST  884  42,3613   00001 C                    RATT
2029                       42,3614   64201 C             SETPD  MXV        RCS TO STABLE MEMBER- B-1X B-29X B+1
2030                       42,3615   00003 1                    2D         2D
2031   REF  35  LAST  835  42,3616   01736 1                    REFSMMAT   STABLE MEMBER.  B-1X B-29X B+1= B-29
2032                       42,3617   65372 1             VSL1   PDDL       8D
2033   REF  24  LAST  830  42,3620   15332 1                    HI6ZEROS
2034   REF   1             42,3621   24025 C             STOVL  YAWANG     ZERO OUT YAWANG, SET UP FOR SMNB
2035   REF   3  LAST  884  42,3622   00003 1                    RCM        TRANSFORMATION. SM COORD. SCALED B-29
2036                       42,3623   77624 1             CALL
2037   REF   5  LAST  674  42,3624   47577 1                    *SMNB*
2038   REF   1             42,3625   00003 1             STORE  R          SAVE NAV. BASE COORDINATES
2039                       42,3626   63256 C             UNIT   PDVL       14D
2040   REF   2  LAST  884  42,3627   00003 1                    R
2041                       42,3630   72431 1             VPROJ  VSL2       COMPUTE PROJECTION OF VECTOR INTO CM
2042   REF   2  LAST  279  42,3631   15324 C                    HIUNITZ    XY-PLANE, R-(R.UZ)UZ
2043                       42,3632   40045 1             BVSU   BOV        CLEAR OVERFLOW INDICATOR IF SET
2044   REF   3  LAST  884  42,3633   00003 1                    R
2045   REF   1             42,3634   65635 1                    COVCNV
2046                       42,3635   40056 C  COVCNV    UNIT   BOV        TEST OVERFLOW FOR INDICATION OF NULL
2047   REF   1             42,3636   65652 C                    NOADJUST   VECTOR
2048                       42,3637   50206 C             PUSH   DOT        20D
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2049  REF   4  LAST  387   42,3640  15330 C            HIUNITX   COMPUTE YAW ANGLE = ACOS (URP.UX)
2050                       42,3641  65552 C      SL1   ACOS      REVOLUTIONS SCALED BO
2051                       42,3642  50315 C      PDVL  DOT       22D YAWANG
2052  REF   1              42,3643  00017 1            URP
2053  REF   2  LAST  279   42,3644  15326 1            HIUNITY   COMPUTE FOLLOWING- URP.UY
2054                       42,3645  51152 C      SL1   BPL       POSITIVE
2055  REF   2  LAST  884   42,3646  65652 C            NOADJUST  YES, 0- 180 DEGREES
2056                       42,3647  45345 1      DLOAD DSU       NO, 181-360 DEGREES 20D
2057  REF  10  LAST  622   42,3650  15340 1            DPPOSMAX  COMPUTE 2 PI MINUS YAW ANGLE
2058                       42,3651  77606 1      PUSH            22D YAWANG
2059                       42,3652  50375 C NOADJUST VLOAD DOT    COMPUTE PITCH ANGLE
2060  REF   1              42,3653  00011 1            UR        ACOS (UR.UZ) - PI/2
2061  REF   3  LAST  884   42,3654  15324 C            HIUNITZ
2062                       42,3655  65552 C      SL1   ACOS      REVOLUTIONS BO
2063                       42,3656  77625 C      DSU
2064  REF   3  LAST  832   42,3657  15322 C            HIDP1/4
2065  REF   4  LAST  273   42,3660  16321 C      STODL RHOSB
2066  REF   2  LAST  884   42,3661  00025 C            YAWANG
2067  REF   2  LAST  273   42,3662  02323 1      STORE GAMMASB   PATCH FOR CHECKOUT
2068                       42,3663  77776 1      EXIT
20681 REF  15  LAST  740   42,3664  3 1044 C      CA    EXTVBACT  IS BIT 5 STILL ON
20682 REF  32  LAST  697   42,3665  7 4706 C      MASK  BIT5
20683                      42,3666  0 0006 1      EXTEND
20684 REF  32  LAST  622   42,3667  1 5423 C      BZF   ENDEXT    NO, WE HAVE BEEN ANSWERED
2069  REF   1              42,3670  3 3704 1      CAF   V06N51    DISPLAY ANGLES
2070  REF 239  LAST  884   42,3671  0 4555 C      TC    BANKCALL
2071  REF   3  LAST  559   42,3672   20504 1      CADR  GOMARKR
2072  REF   7  LAST  508   42,3673  0 5514 1      TC    B5OFF     TERMINATE
2073  REF   8  LAST  885   42,3674  0 5514 1      TC    B5OFF
2074  REF 101  LAST  848   42,3675  0 5112 C      TC    ENDOFJOB  RECYCLE
2075  REF  25  LAST  689   42,3676  3 4710 C      CAF   BIT3      IMMEDIATE RETURN
2076  REF  16  LAST  848   42,3677  0 5415 1      TC    BLANKET   BLANK R3
2077  REF  61  LAST  776   42,3700  3 4712 1      CAF   BIT1      DELAY MINIMUM TIME TO ALLOW DISPLAY IN
2078  REF 240  LAST  885   42,3701  0 4555 C      TC    BANKCALL
2079  REF  12  LAST  756   42,3702   01730 1      CADR  DELAYJOB
2080  REF   2  LAST  243   42,3703  1 3567 1      TCF   SBANDANT +2
2086                       42,3704   01463 1 V06N51 VN   0651
2087                         0002          RCM   EQUALS 2D
2088                         0010          UR    EQUALS 8D
2089                         0016          URP   EQUALS 14D
2090                         0024          YAWANG EQUALS 20D
2091                         0026          PITCHANG EQUALS 22D
2092  REF   4  LAST  884     0002          R     EQUALS RCM
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0001                          31,3215                    BANK   31
0002  REF   1                 31,2000                    SETLOC R35
0003                          31,3215                    BANK

0004  REF   1                                            COUNT  31/R35

0005  REF   2  LAST   87      E4,1724                    EBANK= JLOOPCNT
0006  REF 223  LAST  884      31,3215   0 6006 1 LNDMKSEL TC     INTPRET
0007                          31,3216    77634 0         RTB
0008  REF  25  LAST  884      31,3217    45505 0                 LOADTIME       PICK UP TIME SCALED B-28
0009  REF  37  LAST  694      31,3220    01046 1         STORE   DSPTEM1
0010                          31,3221    77776 1         EXIT
0011  REF   1                 31,3222    3 3535 1 DISGET CAF     V06N34**       DISPLAY GROUND ELAPSED TIME
0012  REF 241  LAST  885      31,3223    0 4555 0        TC      BANKCALL
0013  REF   6  LAST  560      31,3224     20465 1        CADR    GOMARKF
0014  REF  33  LAST  885      31,3225    0 5423 1        TC      ENDEXT         TERMINATE WITH V34E
0015  REF   1                 31,3226    0 3230 0        TC      CALCTLS        PROCEED WITH V33E
0016  REF   1                 31,3227    0 3222 0        TC      DISGET         NEW TIME LOADED VIA V25E
0017  REF 224  LAST  886      31,3230    0 6006 1 CALCTLS TC     INTPRET
0018                          31,3231     43175 0        VLOAD   SET
00181 REF   8  LAST  694      31,3232     02026 1                RLS
001815 REF  12  LAST  854     31,3233     00462 1                ERADFLAG       SET. CONSTANT REARTH (RM)
00182                         31,3234     14001 0        STODL   OD            PDO-5 > RP VECTOR
00183 REF   1                 31,3235     23534 1                RRCSML
00184                         31,3236     14007 0        STODL   6D            PD6-7 > DUMMY TIME
00185 REF   2  LAST  886      31,3237     23534 1                RRCSML         MPAC  > NON-ZERO FOR MOON CASE
001853                        31,3240     77614 1        SET
001856 REF  21  LAST  854     31,3241     01463 1                LUNAFLAG       SET. LUNAR LAT-LONG
00186                         31,3242     77624 1        CALL
00187 REF   1                 31,3243     61762 0                RPTOLONG       RP TO LONG
00188                         31,3244     77745 1        DLOAD
00189 REF   8  LAST  854      31,3245     01106 1                LONG
00189S REF  1                 31,3246     16353 0        STODL   LSLONG         SAVE LND SITE LONG.
0019  REF  38  LAST  886      31,3247     01046 1                DSPTEM1
0020  REF  47  LAST  884      31,3250     34041 0        STCALL  TDEC1          ADVANCE INTEGRATION TO TIME IN TDEC1
0021  REF   7  LAST  855      31,3251     27022 1                CSMPREC        USING PRECISION INTEGRATION
0022                          31,3252     77775 1        VLOAD
0023  REF   6  LAST  596      31,3253     00017 1                RATT1
0025  REF   2  LAST   87      31,3254     02337 1        STORE   POSVECT       SAVE POSITION VECTOR SCALED B-27
0026  REF  15  LAST  854      31,3255     26152 0        STOVL   ALPHAV         FOR LAT-LONG
0028  REF   5  LAST  501      31,3256     00025 0                VATT1
0030  REF   2  LAST   87      31,3257     16345 1        STODL   VELVECT       SAVE VEL. VECTOR B-5
0031  REF  10  LAST  884      31,3260     00015 0                TAT
0032  REF   2  LAST   87      31,3261     36323 0        STCALL  VECTIME        SAVE TIME
0033  REF   7  LAST  854      31,3262     26322 0                LAT-LONG       COMPUTE LAT, LONG, ALT OF S/C  PD>00
0034                          31,3263     76145 0        DLOAD   AXT,1          SAVE S/C LONGITUDE
0035  REF   9  LAST  886      31,3264     01106 1                LONG
0036  REF   2  LAST  886      31,3265     02352 1                LSLONG         XR1 = LANDING SITE LONG--SINUS MEDII,OCE
0037  REF   2  LAST   87      31,3266     36335 1        STCALL  LONGSAVE       ANUS PROCELLARUM, MARE TRANQUILLITEATIS
0038  REF   1                 31,3267     63414 0                ELAPTIME       COMPUTE TL (TIME TO LANDING SITE)
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0039  REF  39  LAST  886   31,3270   01046 1          STORE  DSPTEM1          SAVE TL FOR OUTPUT TO DSKY
0040                       31,3271   77776 1          EXIT
0041  REF   1               31,3272  3 3536 1 DISTLS  CAF    V06N31**         DISPLAY TIME TO LANDING SITE
0042  REF 242  LAST  886   31,3273  0 4555 C          TC     BANKCALL
0043  REF   7  LAST  886   31,3274    20465 1          CADR   GOMARKF
0044  REF  34  LAST  886   31,3275  0 5423 1          TC     ENDEXT           TERMINATE WITH V34E
0045  REF   1               31,3276  0 3300 1          TC     PROCLMKS         PROCEED WITH V33E
0046  REF   1               31,3277  0 3272 C          TC     DISTLS           ILLEGAL RESPONSE, DO AGAIN
0047  REF 225  LAST  886   31,3300  0 6006 1 PROCLMKS TC     INTPRET          BEGIN LANDMARK PROCESSING
0048                       31,3301   75170 C          AXT,1  AXC,2            SET COUNTERS FOR LOOP CONTROL
0049  REF   1               31,3302   00005 1                 KCOUNT
0050  REF   1               31,3303   00002 C                 JCOUNT
0051                       31,3304   43134 C          SXA,2  SET
0052  REF   3  LAST  886   31,3305   02324 C                 JLOOPCNT
0053  REF  13  LAST  886   31,3306   00462 1                 ERADFLAG         USE MEAN LUNAR RADIUS
0054                       31,3307   66730 C KLOOP    SXA,1  SLOAD*
0055  REF   3  LAST  256   31,3310   02325 1                 KLOOPCNT
0056  REF   1               31,3311   23534 1                 BANDTABL +5,1
0057  REF   2  LAST   87    31,3312   16327 C          STODL  NKVAL            SAVE LONGITUDE BAND
0058  REF  11  LAST  885   31,3313   15340 1                 DPPOSMAX
0059  REF   2  LAST   87    31,3314   02330 C          STORE  DELTAL
0060                       31,3315   54170 C JLOOPP   AXT,1  XSU,1            SET XR1 FOR LONGITUDE OF LANDMARK
0061  REF   3  LAST  620   31,3316   63620 C                 LONGTAB -2
0062  REF   4  LAST  887   31,3317   02324 C                 JLOOPCNT
0063                       31,3320   77624 1          CALL
0064  REF   2  LAST  886   31,3321   63414 C                 ELAPTIME         COMPUTE TL (TIME TO LANDMARK)
0065  REF   3  LAST  125   31,3322   02321 C          STORE  XR1HOLD
0066                       31,3323   45014 C          SET    CALL             COMPUTE LATITUDE AND LONGITUDE OF S/C
0067  REF  22  LAST  886   31,3324   01463 1                 LUNAFLAG         AT LANDMARK
0068  REF   8  LAST  886   31,3325   26322 C                 LAT-LONG                                  PD=00
0069                       31,3326   77754 1          LXA,2
0070  REF   5  LAST  887   31,3327   02324 C                 JLOOPCNT
0071                       31,3330   44343 C          DLOAD* BDSU
0072  REF   3  LAST  620   31,3331   54240 C                 LATTAB -2,2
0073  REF  13  LAST  854   31,3332   01104 C                 LAT
0074                       31,3333   41446 1          ABS    PUSH             DELTA LAT = ABS(LAT - LATJ)      PD=02
0075                       31,3334   51025 1          DSU    BPL              DELTAL GREATER THAN DELTA LAT
0076  REF   3  LAST  887   31,3335   02330 C                 DELTAL
0077  REF   1               31,3336   63345 C                 LMKLOOP          NO
0078                       31,3337   45545 1          DLOAD  STADR                                     PD=00
0079  REF   4  LAST  887   31,3340   61447 1          STODL  DELTAL           DELTA LAT = DELTAL
0080  REF   4  LAST  887   31,3341   02321 C                 XR1HOLD
0081  REF  40  LAST  887   31,3342   01046 1          STORE  DSPTEM1          SAVE TIME TO LANDMARK
0082                       31,3343   77734 1          SXA,2
0083  REF   2  LAST   87    31,3344   02333 C                 INDEXNUM         SAVE LANDMARK I.D.
0084                       31,3345   67114 1 LMKLOOP  INCR,2 SXA,2            J = J + 2
0085                       31,3346   77775 1          OCT    -2
0086  REF   6  LAST  887   31,3347   02324 C                 JLOOPCNT
0087                       31,3350   45335 C          SLOAD  DSU
0088  REF  25  LAST  884   31,3351   00050 1                 X2
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0089  REF   3  LAST  887   31,3352   02327 C                NKVAL
0090                       31,3353   52030 C          BHIZ  GOTO      J = NKVAL
0091  REF   1              31,3354   63356 1               DISLID    YES, GO DISPLAY LANDMARK ID, MAYBE TL
0092  REF   1              31,3355   63315 C               JLOOPP    NO, ONE MORE TIME
0093                       31,3356   70535 C  DISLID  SLOAD  SR1     ID = -INDEXNUM/2 + 1
0094  REF   3  LAST  887   31,3357   02334 1               INDEXNUM
0095                       31,3360   63144 0          LXC,2 INCR,2
0096  REF 289  LAST  860   31,3361   00154 1               MPAC +0
0097                       31,3362   00001 C               1D
0098                       31,3363   77534 C          SXA,2 EXIT
0099  REF  24  LAST  729   31,3364   02751 C               LANDMARK
0100  REF   1              31,3365  3 3537 C          CAF   V05N70**  DISPLAY LANDMARK ID
0101  REF 243  LAST  887   31,3366  0 4555 C          TC    BANKCALL
0102  REF   4  LAST  885   31,3367    20504 1          CADR  GOMARKFR
0103  REF  35  LAST  887   31,3370  0 5423 1          TC    ENDEXT    TERMINATE WITH V34E
0104  REF   1              31,3371  0 3376 C          TC    DISTTL    PROCEED WITH V33E
0105  REF   1              31,3372  0 3404 1          TC    NEXTBAND  RECYCLE WITH V32E
0106  REF  20  LAST  837   31,3373  3 4715 C          CAF   FIVE      BLANK R1 AND R3
0107  REF  17  LAST  885   31,3374  0 5415 1          TC    BLANKET
0108  REF 102  LAST  885   31,3375  0 5112 C          TC    ENDOFJOB
0109  REF   2  LAST  886   31,3376  3 3535 1  DISTTL  CAF   V06N34**  DISPLAY GROUND ELAPSED TIME TO LANDMARK
0110  REF 244  LAST  888   31,3377  0 4555 C          TC    BANKCALL
0111  REF   8  LAST  887   31,3400    20465 1          CADR  GOMARKF
0112  REF  36  LAST  888   31,3401  0 5423 1          TC    ENDEXT    TERMINATE WITH V34E
0113  REF   2  LAST  888   31,3402  0 3404 1          TC    NEXTBAND  PROCEED WITH V33E
0114  REF   2  LAST  888   31,3403  0 3376 C          TC    DISTTL    ILLEGAL RESPONSE, DO AGAIN
0115  REF 226  LAST  887   31,3404  0 6006 1  NEXTBAND TC    INTPRET   MUST WE GO ON
0116                       31,3405   66350 1          LXA,1 SSP       RESTORE COUNTER
0117  REF   4  LAST  887   31,3406   02325 1               KLOOPCNT
0118  REF  36  LAST  869   31,3407   00051 C               S1
0119                       31,3410   00001 C               1D
0120                       31,3411   77500 1          TIX,1 EXIT
0121  REF   1              31,3412   63307 C               KLOOP     YES, K = K - 1
0122  REF  37  LAST  888   31,3413  0 5423 1          TC    ENDEXT    K = 0, EXIT R35
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0123                          31,3414  66020 C  ELAPTIME STQ    SXA,1      SAVE RETURN AND INDEX 1
0124  REF   1                 31,3415  02321 C                   RETLOCN
0125  REF   5  LAST  887      31,3416  02320 1                   XR1HCLD
0126                          31,3417  77601 C           SETPD
0127                          31,3420  00001 C                   0D                                  PD=00
0128                          31,3421  65375 C           VLOAD   PDDL                                PD=06
0129  REF   4  LAST  885      31,3422  15324 C                   HIUNITZ    SET UP FOR RP-TO-R
0130  REF   3  LAST  886      31,3423  02323 1                   VECTIME
0131                          31,3424  45125 C           PDDL    CALL                                PD=08
0132  REF  12  LAST  887      31,3425  15340 1                   DPPOSMAX
0133  REF   5  LAST  729      31,3426  55341 1                   RP-TO-R    TRANSFORM PLANETARY TO RCS  PD=00
0134                          31,3427  53515 C           PDVL    UNIT       COMPUTE AND STORE UZ        PD=06
0135  REF   3  LAST  886      31,3430  02337 1                   POSVECT    POSITION VECTOR OF CM SCALED B-27
0136                          31,3431  47206 C           PUSH    VXV        COMPUTE AND STORE UR = UNIT(R)  PD=12
0137  REF   1                 31,3432  00001 C                   UZZ
0138                          31,3433  53572 1           VSL1    UNIT
0139                          31,3434  47206 C           PUSH    VXV        COMPUTE AND STORE UW=UNIT(UR X UZ) PD=18
0140  REF   2  LAST  889      31,3435  00001 C                   UZZ
0141                          31,3436  53572 1           VSL1    UNIT
0142                          31,3437  47315 C           PDVL    VXV        COMPUTE AND STORE UN=UNIT(UW X UZ) PD=24
0143  REF   4  LAST  889      31,3440  02337 1                   POSVECT    POSITION VECTOR OF CM SCALED B-27
0144  REF   3  LAST  886      31,3441  02345 1                   VELVECT    VELOCITY VECTOR OF CM SCALED B-5
0145                          31,3442  53572 1           VSL1    UNIT       COMPUTE AND STORE U = UNIT(R X V)  PD=30
0146                          31,3443  70125 C           PDDL    LXC,1      RESTORE INDEX 1 COMPLEMENTED
0147  REF   3  LAST  886      31,3444  02335 C                   LONGSAVE
0148  REF   6  LAST  889      31,3445  02320 1                   XR1HCLD
0149                          31,3446  41223 1           DSU*    DMP
0150                          31,3447  00001 C                   0,1
0151  REF   3  LAST  886      31,3450  23534 1                   RRCSML
0152                          31,3451  73406 1           PUSH    SIN        DLONG = .997(LONG - LONGJ)       PD=32
0153                          31,3452  76561 1           VXSC    VSL1
0154  REF   1                 31,3453  00023 C                   UNN        U:W = UW COS(DLONG) + UN SIN(DLONG)
0155                          31,3454  71525 C           PDDL    COS                                 PD=36
0156                          31,3455  76561 1           VXSC    VSL1
0157  REF   1                 31,3456  00015 C                   UW
0158                          31,3457  47255 C           VAD     VXV                                 PD=30,PD=24
0159                          31,3460  53572 1           VSL1    UNIT       UD = UNIT (U:W X U)
0160  REF  16  LAST  886      31,3461  02152 C           STORE   ALPHAV     SET UD FOR LAT-LONG--POINT OF CLOSEST
0161                          31,3462  72441 C           DOT     SL1        APPROACH
0162  REF   1                 31,3463  00007 C                   URR        COS (THETA) = (UD . UR)
0163  REF   8  LAST  847      31,3464  02734 C           STORE   CSTH
0164                          31,3465  73526 1           ACOS    SIN        THETA = ACOS(UD.UR), 0 TO PI
0165  REF   8  LAST  847      31,3466  26732 C           STOVL   SNTH       SIN (THETA), 0 TO PI
01651 REF   2  LAST  889      31,3467  00007 C                   URR
01652                         31,3470  50235 C           VXV     DOT
01653 REF  17  LAST  889      31,3471  02152 C                   ALPHAV
01654                         31,3472  00031 C                   24D
01655                         31,3473  71244 C           BPL     DLOAD      CHK (UR X UD).U
01656                         31,3474  63500 1                   +4D
01657 REF   9  LAST  889      31,3475  02732 C                   SNTH        NEG, THETA = 2 PI - THETA
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01658                          31,3476   77676 C          DCOMP                    ERGO SIN (THETA) = - SIN (THETA)
01659  REF  10  LAST  889      31,3477   02732 C          STORE   SNTH
0166                           31,3500   43175 C          VLOAD   SET
0167   REF   5  LAST  889      31,3501   02337 1                  POSVECT
0168   REF   7  LAST  86C      31,3502   03466 C                  RVSW             TIME ONLY
0169   REF  10  LAST  86C      31,3503   26657 1          STOVL   RVEC
0170   REF   4  LAST  889      31,3504   02345 1                  VELVECT
0171   REF  14  LAST  86C      31,3505   02746 C          STORE   VVEC
0172                           31,3506   45160 1          AXC,1   CALL
0173                           31,3507   00012 1                  1OD              MOON ONLY
0174   REF   6  LAST  847      31,3510   24737 1                  TIMETHET         COMPUTE TRANSFER TIME
0175                           31,3511   43014 C          BON     BON
0176   REF   1                 31,3512   04313 1                  COGAFLAG         NO SOLUTION SINCE NEAR RECTILINEAR
0177   REF   1                 31,3513   63523 0                  ETERROR
0178   REF   1                 31,3514   04310 1                  INFINFLG         NO PHYSICAL SOLUTION EXISTS
0179   REF   2  LAST  890      31,3515   63523 C                  ETERROR
0180                           31,3516   43345 1          DLOAD   DAD              COMPUTE GROUND ELAPSED TIME        PD=00
0181   REF   4  LAST  889      31,3517   02323 1                  VECTIME
0182   REF   9  LAST  86C      31,3520   00037 C                  T
0183                           31,3521   77650 1          GOTO
0184   REF   2  LAST  889      31,3522   02321 0                  RETLOCN          EXIT ELAPTIME
0185                           31,3523   52145 0  ETERROR DLOAD   GOTO             RETURN WITH ZERO
0186   REF  25  LAST  884      31,3524   15332 1                  HI6ZEROS
0187   REF   3  LAST  890      31,3525   02321 C                  RETLOCN
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RO18703 SUBROUTINE TO CONVERT RP (VECTOR IN PLAN. COORD. SYSTEM, EITHER
RO18706  EARTH-FIXED OR MOON-FIXED) TO LAT, LONG, ALT.
RO18709 CALLING SEQUENCE
RO18712  L       CALL
RO18715  L+1             RPTOLONG
RO18718 SUBROUTINES USED
RO18721  RP-TO-R, LAT-LONG
RO18724 INPUT
RO18727  PDC-SC = RP VECTOR
RO1873   PDG-TC = TIME
RO18733  MPAC = 0 FOR EARTH, NON-ZERO FOR MOON.
RO18736  ERADFLAG, LUNAFLAG.
RO18739 OUTPUT
RO18742  LATITUDE  IN LAT     (REVS. B-0)
RO18745  LONGITUDE IN LONG    (REVS. B-0)
RO18748  ALTITUDE  IN ALT     (METERS B-29)
 018749 REF   1              30,2000                    SETLOC R35A
 01875                       30,3762                    BANK

 018751                      30,3762   45020 1  RPTOLONG STQ    CALL          SAVE RETURN
 018754 REF   4  LAST  890   30,3763   02321 C           RETLOCN
 018757 REF   6  LAST  889   30,3764   55341 1           RP-TO-R       CONVERT RP TO R, B-27 FOR MOON
 01876                       30,3765   70414 1  BOFF     VSR2          IF LUNAR RESCALE B-27 TO B-29
 018763 REF  23  LAST  887   30,3766   01743 C           LUNAFLAG
 018766                      30,3767   61770 C           +1
 018769 REF  18  LAST  889   30,3770   16152 C  STODL    ALPHAV
 018772 REF   4  LAST  889   30,3771   23534 1           RRCSML        MPAC > DUMMY TIME
 018775                      30,3772   77624 1  CALL
 018778 REF   9  LAST  887   30,3773   26322 C           LAT-LONG
 01878                       30,3774   77650 1  GOTO
 018783 REF   5  LAST  891   30,3775   02321 C           RETLOCN
 018785 REF   2  LAST  886   31,2000              SETLOC R35
 018786                      31,3526              BANK

 0188                        31,3526   77763 C  BANDTABL DEC     -12           +60 DEGREE BAND
 0189                        31,3527   77751 1           DEC     -22           +30 DEGREE BAND
 0190                        31,3530   77737 1           DEC     -32           +00 DEGREE BAND
 0191                        31,3531   77725 1           DEC     -42           -30 DEGREE BAND
 0192                        31,3532   77713 1           DEC     -52           -60 DEGREE BAND
 0193                        31,3533   37716 C  RRCSML   2DEC    .997
 0193                        31,3534   33106 C
 0194                        31,3535   01442 1  VO6N34** VN      00634         ********************************************
 0195                        31,3536   01437 C  VO6N31** VN      00631
 0196                        31,3537   01306 C  VO5N70** VN      00570
 0197                          0005           KCOUNT   EQUALS 5D
 0198                          0002           JCOUNT   EQUALS 2D
 0199                          0022           UNN      EQUALS 18D
 0200                          0014           UW       EQUALS 12D
 0201                          0006           URR      EQUALS 6D
 0202                          0000           UZZ      EQUALS 0D
```

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R0203           **** TEMPORARY VALUES FOR LANDMARK TABLES-LEVINE/SAPONARO****

R02031          LATTAB HAS LATITUDES THAT GO FROM +8 TO -8 DEGREES
R02032          LONGTAB HAS LONGITUDES THAT GO FROM +60 TO -60 DEGREES
R02033          LATTAB AND LONGTAB ARE SCALED REVOLUTIONS BO
R02034          ALTTAB HAS ALTITUDES MEASURED ABOVE THE MEAN LUNAR RADIUS
R02035          ALTTAB IS SCALED IN METERS B-29

 02036 REF   1                                          COUNT  31/LNDMK
 0204           31,3540  77406 0  LATTAB  2DEC  -.015231481     2   5  29 S
 0204           31,3541  56241 0
 0205           31,3542  00043 0          2DEC  .002175926      3   0  47 N
 0205           31,3543  24640 0
 0206           31,3544  00046 0          2DEC  .002361111      4   0  51 N
 0206           31,3545  25716 0
 0207           31,3546  77741 0          2DEC  -.001851852     5   0  40 S
 0207           31,3547  65060 1
 0208           31,3550  00055 1          2DEC  .002777778      6   1  00 N
 0208           31,3551  20266 1
 0209           31,3552  77720 1          2DEC  -.002916667     7   1  03 S
 0209           31,3553  46646 1
 0210           31,3554  77646 0          2DEC  -.005462963     10  1  58 S
 0210           31,3555  57652 1
 0211           31,3556  00155 0          2DEC  .006666667      11  2  24 N
 0211           31,3557  07202 0
 0212           31,3560  00466 0          2DEC  .018935185      12  6  49 N
 0212           31,3561  07373 1
 0213           31,3562  00050 1          2DEC  .00250          13  0  54 N
 0213           31,3563  36561 0
 0214           31,3564  00070 0          2DEC  .003425926      14  1  14 N
 0214           31,3565  04130 1
 0215           31,3566  77662 0          2DEC  -.004722222     15  1  42 S
 0215           31,3567  64143 0
 0216           31,3570  77747 0          2DEC  -.001481481     16  0  32 S
 0216           31,3571  67215 0
 0217           31,3572  00062 0          2DEC  .003101852      17  1  07 N
 0217           31,3573  32207 0
 0218           31,3574  00070 0          2DEC  .003472222      20  1  15 N
 0218           31,3575  34343 1
 0219           31,3576  77463 0          2DEC  -.0125          21  4  30 S
 0219           31,3577  46314 0
 0220           31,3600  00004 0          2DEC  .000277777      22  0  06 N
 0220           31,3601  21505 1
 0221           31,3602  00271 0          2DEC  .011342592      23  4  05 N
 0221           31,3603  32622 0
 0222           31,3604  00101 1          2DEC  .003981481      24  1  26 N
 0222           31,3605  07343 1
 0223           31,3606  77574 1          2DEC  -.008009259     25  2  53 S
 0223           31,3607  70656 0
 0224           31,3610  00065 1          2DEC  .003240741      26  1  10 N
 0224           31,3611  03052 0
```

0225	31,3612	77642 1		2DEC	-.005694444	27	2	03	S
0225	31,3613	66360 1							
0226	31,3614	00045 0		2DEC	.002268518	30	0	49	N
0226	31,3615	05267 1							
0227	31,3616	77577 1		2DEC	-.007824074	31	2	49	S
0227	31,3617	71734 1							
0228	31,3620	00130 0		2DEC	.005416667	32	1	57	N
0228	31,3621	27711 0							
0229	31,3622	05120 1	LONGTAB	2DEC	.161157407	2	58	01	E
0229	31,3623	14712 0							
0230	31,3624	05076 0		2DEC	.160046296	3	57	37	E
0230	31,3625	06264 1							
0231	31,3626	04453 1		2DEC	.143287037	4	51	35	E
0231	31,3627	23531 1							
0232	31,3630	03554 0		2DEC	.116018518	5	41	46	E
0232	31,3631	33074 1							
0233	31,3632	03326 0		2DEC	.106851852	6	38	28	E
0233	31,3633	25112 1							
0234	31,3634	03263 0		2DEC	.104675926	7	37	41	E
0234	31,3635	00252 1							
0235	31,3636	03014 1		2DEC	.094537037	10	34	02	E
0235	31,3637	34505 0							
0236	31,3640	03007 0		2DEC	.094212963	11	33	55	E
0236	31,3641	22564 0							
0237	31,3642	02740 0		2DEC	.091805555	12	33	03	E
0237	31,3643	04432 0							
0238	31,3644	02531 1		2DEC	.083564815	13	30	05	E
0238	31,3645	04017 0							
0239	31,3646	02066 0		2DEC	.065833333	14	23	42	E
0239	31,3647	23501 1							
0240	31,3650	01502 1		2DEC	.050925926	15	18	20	E
0240	31,3651	13664 1							
0241	31,3652	01272 1		2DEC	.042638889	16	15	21	E
0241	31,3653	23036 0							
0242	31,3654	00570 0		2DEC	.023009259	17	8	17	E
0242	31,3655	37365 0							
0243	31,3656	00252 1		2DEC	.010416667	20	3	45	E
0243	31,3657	25253 1							
0244	31,3660	00000 1		2DEC	.000046296	21	0	01	E
0244	31,3661	30213 1							
0245	31,3662	77703 0		2DEC	-.003703704	22	1	20	W
0245	31,3663	52142 1							
0246	31,3664	77254 1		2DEC	-.020694444	23	7	27	W
0246	31,3665	76114 1							
0247	31,3666	77173 1		2DEC	-.023703704	24	8	32	W
0247	31,3667	64334 1							
0248	31,3670	76265 1		2DEC	-.051435185	25	18	31	W
0248	31,3671	51114 1							
0249	31,3672	75644 0		2DEC	-.068055556	26	24	30	W
0249	31,3673	77223 1							

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0250                31,3674   75215 0          2DEC   -.085092593      27   30   38 W
0250                31,3675   72762 1
0251                31,3676   74613 0          2DEC   -.100833333      30   36   18 W
0251                31,3677   76225 0
0252                31,3700   74571 1          2DEC   -.101944444      31   36   42 W
0252                31,3701   67600 0
0253                31,3702   74174 0          2DEC   -.117407407      32   42   16 W
0253                31,3703   54550 0
0254                31,3704   77777 0  ALTTAB  2DEC   -2090 B-29         2
0254                31,3705   75752 0
0255                31,3706   77777 0          2DEC   -2090 B-29         3
0255                31,3707   75752 0
0256                31,3710   77777 0          2DEC   -1790 B-29         4
0256                31,3711   76200 1
0257                31,3712   77777 0          2DEC   -1090 B-29         5
0257                31,3713   76736 1
0258                31,3714   77777 0          2DEC   -940 B-29          6
0258                31,3715   77051 0
0259                31,3716   77777 0          2DEC   -290 B-29          7
0259                31,3717   77556 1
0260                31,3720   77777 0          2DEC   -290 B-29         10
0260                31,3721   77556 1
0261                31,3722   77777 0          2DEC   -1549 B-29        11
0261                31,3723   76370 1
0262                31,3724   77777 0          2DEC   -890 B-29         12
0262                31,3725   77102 1
0263                31,3726   77777 0          2DEC   -1490 B-29        13
0263                31,3727   76426 0
0264                31,3730   77777 0          2DEC   -3230 B-29        14
0264                31,3731   74660 1
0265                31,3732   00000 1          2DEC   5110 B-29         15
0265                31,3733   04773 0
0266                31,3734   00000 1          2DEC   6910 B-29         16
0266                31,3735   06577 1
0267                31,3736   00000 1          2DEC   5110 B-29         17
0267                31,3737   04773 0
0268                31,3740   00000 1          2DEC   3010 B-29         20
0268                31,3741   02741 1
0269                31,3742   00000 1          2DEC   3910 B-29         21
0269                31,3743   03643 0
0270                31,3744   77777 0          2DEC   -935 B-29         22
0270                31,3745   77053 1
0271                31,3746   00000 1          2DEC   2360 B-29         23
0271                31,3747   02234 0
0272                31,3750   00000 1          2DEC   2510 B-29         24
0272                31,3751   02347 0
0273                31,3752   00000 1          2DEC   210 B-29          25
0273                31,3753   00151 1
0274                31,3754   00000 1          2DEC   960 B-29          26
0274                31,3755   00740 1
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L LUNAR LANDMARK SELECTION FOR CM USER'S PAGE NO. 10 E4 S3

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0275                    31,3756   00000 1        2DEC   1310 B-29        27
0275                    31,3757   01217 1
0276                    31,3760   00000 1        2DEC   1410 B-29        30
0276                    31,3761   01301 1
0277                    31,3762   77777 0        2DEC   -2624 B-29       31
0277                    31,3763   75337 1
0278                    31,3764   77777 0        2DEC   -2445 B-29       32
0278                    31,3765   75470 0
```

*** END OF PANDORA .072 ***

L TVCINITIALIZE USER'S PAGE NO. 1 E0 S3

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R1000   NAME     TVCDAPON (TVC DAP INITIALIZATION AND STARTUP CALL)
R1001   MCC NO 3                        DATE  8 JUNE,1967
R1002   MCC BY ENGEL                    LOG SECTION P40-P47

R1003   FUNCTIONAL DESCRIPTION
R1004        PERFORMS TVCDAP INITIALIZATION (GAINS, TIMING PARAMETERS, FILTER VARIABLES, ETC.)
R1006        COMPUTES STEERING (S40.8) GAIN KPRIMEDT, AND ZEROES PASTDELV,+1 VARIABLE
R1008        MAKES INITIALIZATION CALL TO ..NEEDLER.. FOR TVC DAP NEEDLES-SETUP
R1009        PERFORMS INITIALIZATION FOR ROLL DAP
R1010        CALLS TVCEXECUTIVE AT TVCEXEC, VIA WAITLIST
R1011        CALLS TVCDAP CDU-RATE INITIALIZATION PKG AT DAPINIT  VIA T5
R1012        MRCLEAN AND TVCINIT4 ARE POSSIBLE TVC-RESTART ENTRIES
R1013   CALLING SEQUENCE - T5LOC=2CADR(TVCDAPON,EBANK=BZERO), T5=.6SECT5
R1014        IN PARTICULAR, CALLED BY ..IGNOVER..
R1015   NORMAL EXIT MODE
R1016        TCF RESUME
R1017   SUBROUTINES CALLED
R1018        NEEDLER, MASSPROP
R1019   ALARM OR ABORT EXIT MODES
R1020        NONE
R1021   ERASABLE INITIALIZATION REQUIRED
R1022        CSMMASS, LEMMASS, DAPDATR1 (FOR MASSPROP SUBROUTINE)
R1023        TVC PAD LOADS (SEE LEVEL III DAP AND/OR P40 TESTS)
R1024        PACTOFF, YACTOFF, CDUX
R1025        TVCPHASE, T5BITS OF FLAGWRD6, FOR RESTART PROTECTION (SEE IGNOVER)
R1026   OUTPUT
R1027        ALL TVC AND ROLL DAP ERASABLES, FLAGWRD6 (BITS 13,14), T5, WAITLIST
R1028   DEBRIS
R1029        NONE

 1030   REF   1                                    COUNT* $$/INIT
 1031                        17,2032               BANK   17
 1032   REF   3  LAST  68C   17,2000               SETLOC DAPS7
 1033                        17,2032               BANK

 1034   REF   1              E6,1742               EBANK= BZERO

 1035   REF   7  LAST  688   17,2032  22 016 C  TVCDAPON LXCH   BANKRUPT     T5 RUPT ARRIVAL (CALL BY DOTVCON - P40)
 1036                        17,2033  0 0006 1          EXTEND               SAVE Q REQUIRED IN RESTARTS (MRCLEAN AND
10361   REF   7  LAST  688   17,2034  22 012 1          QXCH   QRUPT              TVCINIT4 ARE ENTRIES)
 1038   REF   1              17,2035  3 2207 C  MRCLEAN CAF    NZERO        NUMBER TO ZERO, LESS ONE  (MUST BE ODD)
A1039                                                                      TVC RESTARTS ENTER HERE  (NEW BANK)
 1040   REF 185  LAST  838   17,2036  10 000 C    +1    CCS    A
 1041   REF  14  LAST  684   17,2037  55'447 C          TS     CNTR
 1042   REF 154  LAST  847   17,2040  3 4714 1          CAF    ZERO
 1043   REF  79  LAST  839   17,2041  54 001 1          TS     L
 1044   REF  15  LAST  896   17,2042  51'447 1          INDEX  CNTR
 1045   REF   1              17,2043  53'530 1          DXCH   OMEGAYC       FIRST (LAST) TWO LOCATIONS
 1046   REF  16  LAST  896   17,2044  11'447 C          CCS    CNTR
 1047   REF   1              17,2045  1 2036 1          TCF    MRCLEAN +1
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10471                          17,2046  0 0006 1          EXTEND          SET UP ANOTHER T5 RUPT TO CONTINUE
10472  REF   1                 17,2047  3 2214 1          DCA     INITLOC2        INITIALIZATION AT TVCINIT1
10473  REF  12  LAST  689      17,2050  53'313 C          DXCH    T5LOC   THE PHSCHK2 ENTRY (REDOTVC) AT TVCDAPON
10474  REF  17  LAST  774      17,2051  3 4672 C          CAF     POSMAX          +3 IS IN ANOTHER BANK. MUST RESET
10475  REF   8  LAST  689      17,2052  54 030 C          TS      TIME5           BBCON TOO (FULL 2CADR), FOR THAT
10476  REF  28  LAST  689      17,2053  1 5222 1  ENDMRC  TCF     RESUME          ENTRY.

10477  REF   8  LAST  896      17,2054  22 016 C  TVCINIT1 LXCH    BANKRUPT
10478                          17,2055  0 0006 1          EXTEND
10479  REF   8  LAST  896      17,2056  22 012 1          QXCH    QRUPT

1048   REF  32  LAST  687      17,2057  0 4633 C          TC      IBNKCALL        UPDATE IXX, IAVG/TLX FOR DAP GAINS (R03
1049   REF   4  LAST  651      17,2060   13176 C          CADR    MASSPROP              OR NOUNS 46 AND 47 MUST BE CORRECT)

1050   REF   2  LAST  68C      17,2061  3 2030 C          CAF     MDOTLO          SPS FLOW RATE, SC.AT B+3 KG/CS
1051                          17,2062  0 0006 1          EXTEND
1052   REF   1                 17,2063  7 2210 1          MP      ONETHOU
1053   REF   2  LAST  102      17,2064  55'647 1          TS      TENMDOT         10-SEC MASS LOSS B+16 KG
1054                          17,2065  4 0000 C          COM
1055   REF  11  LAST  661      17,2066  6 1474 1          AD      CSMMASS
1056   REF   7  LAST  661      17,2067  55'662 C          TS      MASSTMP         DECREMENT FOR FIRST 10 SEC OF BURN

1059   REF  6C  LAST  689      17,2070  31'466 1          CAE     DAPDATR1        CHECK LEM-ON/OFF
1060   REF  44  LAST  744      17,2071  7 4675 C          MASK    BIT14
1061   REF 186  LAST  896      17,2072  10 000 C          CCS     A
1062   REF  62  LAST  885      17,2073  3 4712 1          CAF     BIT1            LEM-ON (BIT1)
1063   REF  17  LAST  896      17,2074  55'447 C          TS      CNTR            LEM-OFF (ZERO)

10631  REF  18  LAST  897      17,2075  51'447 1          INDEX   CNTR            PICK UP LM-OFF,-ON KTLX/I
106312 REF   1                 17,2076  31'416 C          CAE     EKTLX/I
106314 REF   2  LAST  102      17,2077  55'646 C          TS      KTLX/I

10632  REF  33  LAST  897      17,2100  0 4633 C          TC      IBNKCALL        COMPUTE 1/CONACC, VARK
106322 REF   1                 17,2101   35145 1          CADR    S40.15

1064   REF   1                 17,2102  31'420 C  TVCINIT2 CAE     ETVCDT/2        LEM-ON VALUE (PAD-LOAD,  CS / 2)
1065   REF  80  LAST  896      17,2103  54 001 1          TS      L
1066   REF  34  LAST  775      17,2104  3 4711 1          CAF     BIT2            LEM-OFF VALUE (4CS / 2)
1067   REF  19  LAST  897      17,2105  51'447 1          INDEX   CNTR
1068   REF 187  LAST  897      17,2106  30 000 1          CAE     A
1069   REF   3  LAST  674      17,2107  55'644 1          TS      KPRIMEDT        (TEMP STORE)

1070                          17,2110  4 0000 C          COM             PREPARE T5TVCDT
1071   REF  18  LAST  897      17,2111  6 4672 C          AD      POSMAX
1072   REF  63  LAST  897      17,2112  6 4712 1          AD      BIT1
1073   REF   3  LAST  244      17,2113  55'635 1          TS      T5TVCDT

10732  REF  36  LAST  697      17,2114  4 4674 1          CS      BIT15           RESET SWTOVER FLAG
10733  REF  10  LAST  651      17,2115  7 0105 1          MASK    FLAGWRD9
10734  REF  11  LAST  897      17,2116  54 105 1          TS      FLAGWRD9
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1074  REF  20  LAST  897  17,2117  51'447 1          INDEX  CNTR      PICK UP LEM-OFF,-ON KPRIME
1075  REF   1              17,2120  31'413 0          CAE    EKPRIME
1076                       17,2121  0 0006 1          EXTEND
1077  REF   4  LAST  897  17,2122  7 1644 1          MP     KPRIMEDT  (TVCDT/2, SC.AT B+14CS)
1078  REF 188  LAST  897  17,2123  22 000 1          LXCH   A         SC.AT PI/8   (DIMENSIONLESS)
1079  REF   5  LAST  898  17,2124  53'645 0          DXCH   KPRIMEDT

1080  REF  21  LAST  898  17,2125  51'447 1          INDEX  CNTR      PICK UP LEM-OFF,-ON REPFRAC
1081  REF   2  LAST  673  17,2126  31'423 0          CAE    EREPFRAC
1082  REF   4  LAST  675  17,2127  55'652 0          TS     REPFRAC

1083  REF  14  LAST  573  17,2130  3 7716 0          CAF    NEGONE    PREVENT STROKE TEST UNTIL CALLED
1084  REF   2  LAST  102  17,2131  55'664 0          TS     STRKTIME

1085  REF   1              17,2132  3 4374 0          CAF    NINETEEN  SET VCNTR FOR VARIABLE-GAIN UPDATES IN
1086  REF   4  LAST  675  17,2133  55'653 1          TS     VCNTR        10 SECONDS (TVCEXEC 1/2 SEC RATE)
10862 REF   7  LAST  66C  17,2134  55'444 0          TS     V97VCNTR  FOR ENGFAIL (R41) LOGIC

1087  REF   1              17,2135  31'421 1          CAE    ETSWITCH  PREPARE SWITCHOVER COUNTER
1088  REF  81  LAST  897  17,2136  54 001 1          TS     L
1089                       17,2137  6 0000 1          DOUBLE           (COUNTER DECREMENTS EVERY 1/2 SEC)
1090  REF 189  LAST  898  17,2140  22 000 1          LXCH   A         LEM-OFF IN A, LEM-ON IN L
1091  REF  22  LAST  898  17,2141  51'447 1          INDEX  CNTR
1092  REF 190  LAST  898  17,2142  30 000 1          CAE    A
1093  REF  15  LAST  898  17,2143  6 7716 0          AD     NEGONE
1094  REF  23  LAST  898  17,2144  55'447 0          TS     CNTR      CNTR = 2(SWITCHOVER TIME, SEC) -1

1095  REF  16  LAST  687  17,2145  31'425 0  TVCINIT3 CAE    PACTOFF   TRIM VALUES TO TRIM-TRACKERS, OUTPUT
1096  REF   2  LAST  101  17,2146  55'625 0          TS     PDELOFF      TRACKERS, OFFSET-UPDATES, AND
1097  REF   4  LAST  166  17,2147  55'631 0          TS     PCMD         OFFSET-TRACKER FILTERS
1099  REF   3  LAST  652  17,2150  55'621 1          TS     DELPBAR      NOTE, LO-ORDER DELOFF,DELBAR ZEROED

1100  REF   5  LAST  684  17,2151  31'426 0          CAE    YACTOFF
1101  REF   2  LAST  101  17,2152  55'627 1          TS     YDELOFF
1102  REF   2  LAST  101  17,2153  55'632 0          TS     YCMD
1104  REF   3  LAST  652  17,2154  55'623 0          TS     DELYBAR

1111  REF  12  LAST  689  17,2155  4 1501 0  NEEDLEIN CS     RCSFLAGS  SET BIT 3 FOR INITIALIZATION PASS AND GO
1112  REF  26  LAST  885  17,2156  7 4710 1          MASK   BIT3         TO NEEDLER.  WILL CLEAR FOR TVC DAP
1113  REF  13  LAST  898  17,2157  27'501 0          ADS    RCSFLAGS     (RETURNS AFTER CADR)
1114  REF  34  LAST  897  17,2160  0 4633 0          TC     IBNKCALL
1115  REF   5  LAST  538  17,2161   42404 1          CADR   NEEDLER

1116  REF 155  LAST  896  17,2162  3 4714 1  TVCINIT4 CAF    ZERO      SET TVCPHASE TO INDICATE TVCDAPON-THRU-
1117  REF   3  LAST  649  17,2163  55'654 0          TS     TVCPHASE     NEEDLEIN INITIALIZATION FINISHED.
A1118                                                                  (POSSIBLE TVC-RESTART ENTRY)

1119  REF  18  LAST  733  17,2164  30 032 0          CAE    CDUX      PREPARE ROLL DAP LADDERS
1120  REF   6  LAST  187  17,2165  55'672 1          TS     DOGNOW
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A1121                                                          ROLL DAPS RE-START UPON A RESTART, BUT
A1122                                                          RETAIN ORIGINAL DGAD (IGNOVER CDUX)

 11222 REF  32 LAST  824   17,2166  3 4676 1        CAF    BIT13      IF ENGINE IS ALREADY OFF, ENGINOFF HAS
 11223                     17,2167  0 0006 1        EXTEND                ALREADY ESTABLISHED THE POST-BURN
 11224 REF  27 LAST  780   17,2170  02 011 C        RAND   DSALMOUT      CSMMASS (MASSBACK DOES IT). DONT
 11225                     17,2171  0 0006 1        EXTEND                TOUCH CSMMASS.  IF ENGINE IS ON,
 11226                     17,2172  1 2175 1        BZF    +3             THEN ITS OK TO DO THE COPYCYCLE
A11227                                                                   EVEN BURNS LESS THAN 0.45EC ARE AOK

 1123  REF   8 LAST  897   17,2173  31'662 1        CAE    MASSTMP     COPYCYCLE
 1124  REF  12 LAST  897   17,2174  55'474 C        TS     CSMMASS

 1125  REF   5 LAST  697   17,2175  3 4731 C   +3   CAF    .5SEC       CALL TVCEXECUTIVE (ROLLDAP CALL, ETC)
 1126  REF  40 LAST  776   17,2176  0 5140 1        TC     WAITLIST
 1127  REF   2 LAST  896   E6,1742                  EBANK=  BZERO
 1128  REF   1             17,2177   02660 C       2CADR  TVCEXEC
 1128  REF   1             17,2200   34066 C

 1129                      17,2201  0 0006 1        EXTEND              CALL FOR DAPINIT
 1130  REF   1             17,2202  3 2212 1        DCA    DAPINIT5
 1131  REF  13 LAST  897   17,2203  53'313 C        DXCH   T5LOC
 1132  REF   4 LAST  897   17,2204  31'635 C        CAE    T5TVCDT      (ALLOW TIME FOR RESTART COMPUTATIONS)
 1133  REF   9 LAST  897   17,2205  54 030 C        TS     TIME5

 1134  REF  29 LAST  897   17,2206  1 5222 1  ENDTVCIN TCF    RESUME

 1135                      17,2207   00101 1  NZERO    DEC    65          MUST BE ODD FOR MRCLEAN

 1136  REF  17 LAST  438     4374            NINETEEN =      VD1

 1137                      17,2210   03720 1  ONETHOU  DEC    1000 B-13   KG/CS B3 TO KG/10SEC B16 CONVERSION

 1138  REF   3 LAST  899   E6,1742                  EBANK=  BZERO
 1139  REF   1             17,2211   03075 C  DAPINIT5 2CADR  DAPINIT
 1139  REF   1             17,2212   40066 C

11392  REF   4 LAST  899   E6,1742                  EBANK=  BZERO
 1140  REF   1             17,2213   02054 1  INITLOC2 2CADR  TVCINIT1
 1140  REF   1             17,2214   36066 1
```

L TVCEXECUTIVE USER'S PAGE NO. 1 EO 53

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R1000   PROGRAM NAME.... TVCEXECUTIVE, CONSISTING OF TVCEXEC, NEEDLEUP, VARGAINS
R1001                     REPCHEK, SWTCHOVR, CG.CORR, STRKUP, TVCEXFIN, ETC.
R1002   LOC SECTION....TVCEXECUTIVE     SUBROUTINE ....DAPCSM
R1003   MOD BY ENGEL                    DATE 23 OCT, 1967

R1004   FUNCTIONAL DESCRIPTION....

R1005        *A SELF-PERPETUATING WAITLIST TASK AT 1/2 SECOND INTERVALS WHICH:
R1006         PREPARES THE ROLL TVC DAP LADDERS
R1007         PREPARES THE ROLL FDAI NEEDLE (FLY-TO  OGA ERROR)
R1008         PREPARES THE ROLL PHASE PLANE  OGAERR  (FLY-FROM  OGA ERROR)
R1009         PREPARES THE TVC ROLLDAP TASK WAITLIST CALL (3 CS DELAY)
R1010         UPDATES THE NEEDLES DISPLAY
R1011         IMPLEMENTS VARIABLE GAINS AND VARIABLE VEHICLE MASS
R1012         PROVIDES FOR SWITCHOVER
R1013         PROVIDES FOR A SINGLE-SHOT THRUST MISALIGNMENT CORRECTION AT SWTOVR
R1014         PROVIDES FOR REPETITIVE THRUST MISALIGNMENT CORRECTIONS FOLLOWING
R1015              SWITCHOVER
R1016         PERFORMS CERTAIN STROKE TEST FUNCTIONS

R1017   CALLING SEQUENCE....

R1018        *TVCEXEC CALLED AS A WAITLIST TASK, IN PARTICULAR BY TVCINIT4 AND BY
R1019         ITSELF, BOTH AT 1/2 SECOND INTERVALS

R1020   NORMAL EXIT MODE.... TASKOVER

R1021   ALARM OR ABORT EXIT MODES.... NONE

R1022   SUBROUTINES CALLED....NEEDLER, S40.15, MASSPROP, TASKOVER, IBNKCALL

R1023   OTHER INTERFACES....

R1024        *TVCRESTART PACKAGE FOR RESTARTS
R1025        *PITCHDAP, YAWDAP FOR VARIABLE GAINS AND ENGINE TRIM ANGLES
R1026        *S40.8 FOR KPRIMEDT AT SWITCHOVER

R1027   ERASABLE INITIALIZATION REQUIRED....

R1028        *SEE TVCDAPON....TVCINIT4
R1029        *VARK AND 1/CONACC (S40.15 OF RO3)
R1030        *VGB INITIALIZATION PRIOR TO SWITCHOVER OR FOLLOWING A RESTART
R1031         DURING A STROKE TEST, IF STROKE TEST FUNCTIONS ARE TO BE TESTED
R1032        *PAD LOADS EREPFRAC, ECORFRAC ETC.
R1033        *BITS 15,14 OF FLAGWRD6 (T5 BITS)
R1034        *TVCEXPHS FOR RESTARTS
R1035        *ENGINE-ON BIT (11.13) FOR RESTARTS
R1036        *CDUX, OGAD

R1037   OUTPUT....
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R1038        *ROLL TVC DAP LADDERS, FDAI NEEDLE (AK), AND PHASE PLANE OGAERR
R1039        *VARIABLE GAINS FOR PITCH/YAW AND ROLL TVC DAPS
R1040        *SINGLE-SHOT AND REPETITIVE CORRECTIONS TO ENGINE TRIM ANGLES
R1041         FACTOFF AND YACTOFF
R1042        *CHANGES TO DAP SAMPLE RATES, DAP GAINS, AND STEERING-GAIN SCALING
R1043         AT (LEM-ON) SWITCHOVER
R1044        *STROKER, 4 SECONDS AFTER SWITCHOVER WHEN PRIOR V68, OR 2.5
R1045         SECONDS AFTER RESTART DURING A STROKE TEST

R1046   DEBRIS.... MUCH, BUT SHAREABLE WITH RCS/ENTRY, ALL IN EBANK6


 1047                          16,2660                    BANK   16
 1048   REF   1                16,2000                    SETLOC DAPRCLL
 1049                          16,2660                    BANK
 1050   REF   5  LAST  899     E6,1742                    EBANK= BZERO
 1051   REF   1                                          COUNT* $$/TVCX
 1052   REF  24  LAST  689     16,2660  4 0102 C  TVCEXEC CS     FLAGWRD6      CHECK FOR TERMINATION (BITS 15,14 READ
 1053   REF  12  LAST  689     16,2661  7 4105 C          MASK   OCT60000           10 FROM TVCDAPON TO RCSDAPON)
 1054                          16,2662  0 0006 1          EXTEND
 1055   REF   1                16,2663  6 3142 0          BZMF   TVCEXFIN      TERMINATE

 1056   REF   6  LAST  899     16,2664  3 4731 0          CAF    .5SEC         W.L. CALL TO PERPETUATE TVCEXEC
 1057   REF  41  LAST  899     16,2665  0 5140 1          TC     WAITLIST
 1058   REF   6  LAST  901     E6,1742                    EBANK= BZERO
 1059   REF   2  LAST  899     16,2666   02660 C          2CADR  TVCEXEC
 1059                          16,2667   34066 C

 1060   REF  19  LAST  898     16,2670  30 032 C  ROLLPREP CAE    CDUX          UPDATE ROLL LADDERS (NO NEED TO RESTART-
 1061   REF   7  LAST  898     16,2671  57'672 C          XCH    OGANCW             PROTECT, SINCE ROLL DAPS RE-START)
 1062   REF   2  LAST  102     16,2672  57'673 1          XCH    OGAPAST

 1063   REF   2  LAST  648     16,2673  31'450 1          CAE    OGAD          PREPARE ROLL FDAI NEEDLE  WITH FLY-TO
 1064                          16,2674  0 0006 1          EXTEND                     ERROR (COMMAND - MEASURED)
 1065   REF   8  LAST  901     16,2675  21'672 1          MSU    OGANCW
 1066   REF  12  LAST  537     16,2676  55'476 1          TS     AK            FLY-TO OGA ERROR, SC.AT B-1 REVS

 1067                          16,2677  0 0006 1          EXTEND                PREPARE ROLL DAP PHASE PLANE  OGAERR
 1068   REF   2  LAST  685     16,2700  7 7705 C          MP     -BIT14
 1069   REF   1                16,2701  55'674 1          TS     OGAERR        PHASE-PLANE (FLY-FROM) OGAERROR,
A1070                                                                              SC.AT B+0 REVS

 1071   REF  27  LAST  776     16,2702  3 6214 C          CAF    THREE         SET UP ROLL DAP TASK (ALLOW SOME TIME)
 1072   REF  42  LAST  901     16,2703  0 5140 1          TC     WAITLIST
 1073   REF   7  LAST  901     E6,1742                    EBANK= BZERO
 1074   REF   1                16,2704   03312 1          2CADR  ROLLDAP
 1074   REF   1                16,2705   34066 C
 1075   REF  35  LAST  898     16,2706  0 4633 C  NEEDLEUP TC     IBNKCALL      DO A NEEDLES UPDATE (RETURNS AFTER CADR)
 1076   REF   6  LAST  898     16,2707   42404 1          CADR   NEEDLER             (NEEDLES RESTARTS ITSELF)
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1077   REF  33  LAST  899   16,2710  3 4676 1  VARGAINS CAF    BIT13      CHECK ENGINE-ON BIT TO INHIBIT VARIABLE
1078                        16,2711  0 0006 1           EXTEND             GAINS AND MASS IF ENGINE OFF
1079   REF  28  LAST  899   16,2712  02 011 C           RAND   DSALMOUT   CHANNEL 11
1080   REF 191  LAST  898   16,2713  10 000 C           CCS    A
1081                        16,2714  1 2720 1           TCF    +4                ON , SO OK TO UPDATE GAINS AND MASS
1082   REF  37  LAST  779   16,2715  3 4711 1    +5     CAF    TWO               OFF, SO BYPASS MASS/GAIN UPDATES,
10821  REF   3  LAST  649   16,2716  55'661 C           TS     TVCEXPHS                ALSO ENTRY FROM CCS BELOW WITH
10822  REF   1              16,2717  1 2750 C           TCF    SWT/COR                 VCNTR = -0 (V97 R40 ENGFAIL)

10823  REF   5  LAST  898   16,2720  11'653 1           CCS    VCNTR             TEST FOR GAIN UPDATE TIME
10824                       16,2721  1 2725 1           TCF    +4                     NOT YET
10825  REF   1              16,2722  1 2731 1           TCF    GAINCHNG               NOW
108252                      16,2723  1 2723 1           TCF    +0                     NOT USED
108253 REF   1              16,2724  1 2715 1           TCF    VARGAINS +5            NO, LOTHRUST (S40.8 R40)

10826  REF   3  LAST  679   16,2725  55'663 1    +4     TS     VCNTRTMP          PROTECT VCNTR AND
10827  REF  13  LAST  899   16,2726  31'474 1           CAE    CSMMASS           CSMMASS DURING AN IMPULSIVE BURN
10828  REF   9  LAST  899   16,2727  55'662 C           TS     MASSTMP
10829  REF   1              16,2730  1 2741 C           TCF    EXECCOPY

1085   REF  36  LAST  901   16,2731  0 4633 C  GAINCHNG TC     IBNKCALL   UPDATE IXX, IAVG, IAVG/TLX
1086   REF   1              16,2732   13232 C           CADR   FIXCW      MASSPROP ENTRY  (ALREADY INITIALIZED)
1087   REF   2  LAST  897   16,2733  0 3145 1           TC     S40.15     UPDATE 1/CONACC, VARK
1089   REF   3  LAST  897   16,2734  4 1647 1           CS     TENMDOT    UPDATE MASS FOR NEXT 10 SEC. OF BURN
1090   REF  14  LAST  902   16,2735  6 1474 1           AD     CSMMASS
1091   REF  10  LAST  902   16,2736  55'662 C           TS     MASSTMP    KG B+16

1092   REF   2  LAST  898   16,2737  3 4374 C           CAF    NINETEEN   RESET THE VARIABLE-GAIN UPDATE COUNTER
1093   REF   4  LAST  902   16,2740  55'663 1  NOUPDATE TS     VCNTRTMP   (COUNTDOWN, FROM VARGAINS +1)

1094   REF   4  LAST  902   16,2741  25'661 1  EXECCOPY INCR   TVCEXPHS   RESTART-PROTECT THE COPYCYCLE          (1)

1095   REF  11  LAST  902   16,2742  31'662 1           CAE    MASSTMP    CSMMASS KG B+16
1096   REF  15  LAST  902   16,2743  55'474 C           TS     CSMMASS

1097   REF   5  LAST  902   16,2744  31'663 C           CAE    VCNTRTMP   VCNTR
1098   REF   6  LAST  902   16,2745  55'653 1           TS     VCNTR
10982  REF   8  LAST  898   16,2746  55'444 C           TS     V97VCNTR   FOR ENGFAIL (R41) MASS UPDATES AT SPSOFF

1099   REF   5  LAST  902   16,2747  25'661 1           INCR   TVCEXPHS   COPYCYCLE OVER                          (2)

1100   REF  24  LAST  898   16,2750  11'447 C  SWT/COR  CCS    CNTR       CHECK FOR SWITCHOVER/CG.CORRECTION
1101                        16,2751  1 2755 C           TCF    +4                NOT YET
1102   REF   1              16,2752  1 2773 1           TCF    SWTCHCVR          NOW
1103   REF   1              16,2753  1 2761 1           TCF    REPCHEK           PRIOR SWITCHOVER (OR NONE)
1104   REF   2  LAST  902   16,2754  1 2773 1           TCF    SWTCHCVR          NOW (1/2 SEC SWITCHOVER, ONLY)

1105   REF   2  LAST  102   16,2755  55'707 1    +4     TS     CNTRTMP    COUNT DOWN
1106   REF  14  LAST  845   16,2756  3 4716 C           CAF    SEVEN      SETUP TVCEXPHS FOR ENTRY AT CNTRCOPY
1107   REF   6  LAST  902   16,2757  55'661 C           TS     TVCEXPHS
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1108  REF   1                  16,2760  1 3122 1          TCF    CNTRCCPY

1109  REF   5  LAST  898       16,2761  31'652 1  REPCHEK CAE    REPFRAC     CHECK FOR REPETITIVE UPDATES
1110                            16,2762  0 0006 1          EXTEND
1111                            16,2763  6 2770 C          BZMF   +5                 NO   (NEG OR +-ZERO)
1112  REF   2  LAST   99        16,2764  55'446 1          TS     TEMPDAP +1         YES, SET UP CORRECTION FRACTION
1113  REF  21  LAST  888       16,2765  3 4715 C          CAF    FIVE                    ADVANCE TVCEXPHS
1114  REF   7  LAST  902       16,2766  55'661 C          TS     TVCEXPHS
1115  REF   1                  16,2767  1 3053 C          TCF    CORSETUP

1116  REF   1                  16,2770  3 4707 C    +5    CAF    EIGHT
1117  REF   8  LAST  903       16,2771  55'661 C          TS     TVCEXPHS
1118  REF   1                  16,2772  1 3125 C          TCF    STRKUP

1119  REF  34  LAST  902       16,2773  3 4676 1  SWTCHOVR CAF    BIT13       CHECK ENGINE-ON BIT, NOT PERMITTING
1120                            16,2774  0 0006 1          EXTEND                  SWITCHOVER DURING ENGINE-SHUTDOWN
1121  REF  29  LAST  902       16,2775  02 011 C          RAND   DSALMOUT        TAILOFF
1122  REF 192  LAST  902       16,2776  10 000 C          CCS    A
1123                            16,2777  1 3001 1          TCF    +2          OK TO SWITCHOVER
1124  REF   2  LAST  901       16,3000  1 3142 1          TCF    TVCEXFIN    DONT SWITCHOVER, TERMINATE

11242 REF  12  LAST  897       16,3001  4 0105 1          CS     FLAGWRD9    SET SWITCHOVER FLAG (SWTOVER) FOR DWNLNK
11243 REF  37  LAST  897       16,3002  7 4674 1          MASK   BIT15               AND POST-BURN TRIM UPDATES (SEE
11244 REF  13  LAST  903       16,3003  26 105 1          ADS    FLAGWRD9            ..BESTTRIM.. (P40-P47))

1125  REF  61  LAST  897       16,3004  31'466 1          CAE    DAPDATR1    SWITCHOVER....CHECK FOR LEM-OFF/ON
1126  REF  35  LAST  903       16,3005  7 4676 C          MASK   BIT13       (NOTE, SHOWS LEM-OFF)
1127                            16,3006  0 0006 1          EXTEND
1128  REF   1                  16,3007  1 3013 1          BZF    GAINDOWN    LEM-ON....FULL SWITCHOVER/CG.CORRECTION

1129  REF  10  LAST  845       16,3010  3 4710 C          CAF    FOUR        LEM-OFF....NO SWITCHOVER, JUST CG.CORR.
1130  REF   9  LAST  903       16,3011  55'661 C          TS     TVCEXPHS
1131  REF   1                  16,3012  1 3050 C          TCF    TEMPSET

1132  REF   2  LAST  897       16,3013  31'420 C  GAINDOWN CAE    ETVCDT/2    LEM-ON.... DROP GAIN BY (OLDTVCDT/8CS)SQ
1133                            16,3014  0 0006 1          EXTEND
1134  REF  33  LAST  885       16,3015  7 4706 C          MP     BIT5
1135  REF 193  LAST  903       16,3016  22 000 1          LXCH   A
1136                            16,3017  0 0006 1          EXTEND
1137  REF 194  LAST  903       16,3020  7 0000 C          MP     A
1138  REF 195  LAST  903       16,3021  22 000 1          LXCH   A           (TVCDT/8CS)SQD, SC.AT B+2

1139                            16,3022  0 0006 1          EXTEND             PREPARE NEW GAIN CONSTANT
1140  REF   3  LAST  897       16,3023  7 1646 C          MP     KTLX/I
1141                            16,3024  20 001 1          DDOUBL
1142                            16,3025  20 001 1          DDOUBL
1143  REF   2  LAST  102       16,3026  55'702 1          TS     TKTLX/I     (FOR COPYCYCLE)

1144  REF  10  LAST  903       16,3027  25'661 1  SWTCOPY INCR   TVCEXPHS     RESTART-PROTECT THE COPYCYCLE        (3)
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1145  REF   1                16,3030  3 7677 0            CAF     OCT37774        LEM-ON ONLY..... T5 TIMER
1146  REF   5  LAST  899     16,3031  55'635 1            TS      T5TVCDT

1150  REF   2  LAST  898     16,3032  31'414 1            CAE     EKPRIME +1      PREPARE KPRIMEDT FOR 80MS DAP, USING
1151                          16,3033  6 0000 1            DOUBLE
1152                          16,3034  6 0000 1            DOUBLE
1153  REF   6  LAST  898     16,3035  55'644 1            TS      KPRIMEDT            (KPRIMEDT+1 IS ZERO)

A1154                                                                                 SCALING OF OMEGAC HAS CHANGED, BUT NO
A1155                                                                                     CHANGE OF REGISTERS.  RATE COMMANDS
A1156                                                                                     ARE LOW BY  (OLD TVCDT)/80,  UNTIL
A1157                                                                                     NEXT S40.8 COMPUTATION, WHICH USES
A1158                                                                                     THE NEW  KPRIMEDT.

1159  REF   3  LAST  903     16,3036  31'702 0            CAE     TKTLX/I         GAIN CONSTANT
1160  REF   4  LAST  903     16,3037  55'646 0            TS      KTLX/I

11602 REF   3  LAST  902     16,3040  0 3154 1            TC      S40.15 +7       UPDATE VARK (ONLY, NO CHANGE I/CONACC)

1161  REF   3  LAST  244     16,3041  11'614 1  STRKCALL  CCS     STROKER         CHECK STROKER FOR VERB 68 INDICATION
1162                          16,3042  1 3047 0            TCF     +5                  STROKE TEST IN PROGRESS (80MS DAP)
1163                          16,3043  1 3047 0            TCF     +4                  +0 SAYS NO VERB 68 YET
1164                          16,3044  1 3047 0            TCF     +3                  STROKE TEST IN PROGRESS (80MS DAP)
1165  REF   2  LAST  903     16,3045  3 4707 0            CAF     EIGHT               -0 SAYS PRIOR VERB68, SO START
1166  REF   3  LAST  898     16,3046  55'664 0            TS      STRKTIME                STROKE TEST IN 4 SECONDS

1167  REF  11  LAST  903     16,3047  25'661 1     +543   INCR    TVCEXPHS        COPYCYCLE OVER (SWTCHOVR ENTRY NEXT) (4)

1168  REF   1                16,3050  31'422 1  TEMPSET   CAE     ECORFRAC            SET UP CORRECTION FRACTION
1169  REF   3  LAST  903     16,3051  55'446 1            TS      TEMPDAP +1

1170  REF  12  LAST  904     16,3052  25'661 1            INCR    TVCEXPHS        ENTRY FROM REPCHECK AT NEXT LOCATION (5)

1171  REF  62  LAST  903     16,3053  31'466 1  CORSETUP  CAE     DAPDATR1        CHECK FOR LEM-OFF/ON
1172  REF  36  LAST  903     16,3054  7 4676 0            MASK    BIT13           (NOTE, SHOWS LEM-OFF)
1173                          16,3055  0 0006 1            EXTEND
1174                          16,3056  1 3060 0            BZF     +2              LEM IS ON,  PICK UP   TEMPDAP+1
1175  REF   4  LAST  904     16,3057  31'446 0            CAE     TEMPDAP +1      LEM IS OFF, PICK UP 2(TEMPDAP+1)
1176  REF   5  LAST  904     16,3060  6 1446 0            AD      TEMPDAP +1
1177  REF   6  LAST  904     16,3061  55'445 1            TS      TEMPDAP         CG.CORR USES TEMPDAP

1178  REF  16  LAST  898     16,3062  3 7716 0            CAF     NEGONE          SET UP FOR CNTR = -1 (SWTCHOVR DONE)
1179  REF   3  LAST  902     16,3063  55'707 1            TS      CNTRTMP             (COPYCYCLE AT  .CNTRCOPY. )

1180                          16,3064  0 0006 1  CG.CORR   EXTEND                  PITCH TRIM-TRACKER CORRECTION
1181  REF   3  LAST  898     16,3065  3 1626 1            DCA     PDELOFF
1182  REF   2  LAST  102     16,3066  53'704 1            DXCH    PACTTMP
1183  REF  17  LAST  898     16,3067  4 1425 1            CS      PACTOFF
1184  REF   4  LAST  898     16,3070  6 1621 0            AD      DELPBAR
1185                          16,3071  0 0006 1            EXTEND
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1186  REF  7  LAST  904   16,3072  7 1445 1          MP      TEMPCAP
1187                      16,3073  20 001 1          DDOUBL
1188                      16,3074  20 001 1          DDOUBL
1189  REF  3  LAST  904   16,3075  21'704 1          DAS     PACTTMP

1190                      16,3076  0 0006 1          EXTEND
1191  REF  3  LAST  898   16,3077  3 1630 C          DCA     YDELCFF
1192  REF  2  LAST  102   16,3100  53'706 C          DXCH    YACTTMP
1193  REF  6  LAST  898   16,3101  4 1426 1          CS      YACTCFF
1194  REF  4  LAST  898   16,3102  6 1623 1          AD      DELYBAR
1195                      16,3103  0 0006 1          EXTEND
1196  REF  8  LAST  905   16,3104  7 1445 1          MP      TEMPCAP
1197                      16,3105  20 001 1          DDOUBL
1198                      16,3106  20 001 1          DDOUBL
1199  REF  3  LAST  905   16,3107  21'706 C          DAS     YACTTMP

1200  REF  13 LAST  904   16,3110  25'661 1  CORCOPY  INCR    TVCEXPHS        RESTART-PROTECT THE COPYCYCLE        (6)

1201                      16,3111  0 0006 1          EXTEND                  TRIM-ESTIMATES, AND
1202  REF  4  LAST  905   16,3112  3 1704 C          DCA     PACTTMP
1203  REF  18 LAST  904   16,3113  55'425 1          TS      PACTCFF             TRIMS
1204  REF  4  LAST  904   16,3114  53'626 C          DXCH    PDELCFF

1205                      16,3115  0 0006 1          EXTEND
1206  REF  4  LAST  905   16,3116  3 1706 1          DCA     YACTTMP
1207  REF  7  LAST  905   16,3117  55'426 1          TS      YACTCFF
1208  REF  4  LAST  905   16,3120  53'630 1          DXCH    YDELCFF

1209  REF  14 LAST  905   16,3121  25'661 1          INCR    TVCEXPHS        COPYCYCLE OVER (SWT/COR ENTRY NEXT)  (7)

1210  REF  4  LAST  904   16,3122  31'707 C  CNTRCOPY CAE     CNTRTMP         UPDATE CNTR (RESTARTS OK, FOLLOWS CPYCY)
1211  REF  25 LAST  902   16,3123  55'447 C          TS      CNTR

1212  REF  15 LAST  905   16,3124  25'661 1          INCR    TVCEXPHS        ENTRY FROM REPCHECK AT NEXT LOCATION (8)

1213  REF  4  LAST  904   16,3125  11'664 C  STRKUP   CCS     STRKTIME        CHECK STROKE TEST START TIME
1214                      16,3126  1 3131 C          TCF     +3                  IN 4SEC DELAY AFTER SWITCHOVER
1215  REF  1              16,3127  1 3133 1          TCF     STRKNOW             START STROKE TEST NOW....
1216  REF  3  LAST  903   16,3130  1 3142 1          TCF     TVCEXFIN            NO STROKE TEST REQUEST YET

1217  REF  2  LAST  102   16,3131  55'710 1          TS      STRKTTMP        COUNT DOWN
1218  REF  1              16,3132  1 3137 C          TCF     STRKTCPY

1219  REF  5  LAST  550   16,3133  31'412 1  STRKNOW  CAE     ESTRCKER        START THE STROKE TEST NOW....
1220  REF  4  LAST  904   16,3134  55'614 1          TS      STROKER
1221  REF  17 LAST  904   16,3135  3 7716 C          CAF     NEGONE          KILL THE STROKE TEST CALL
1222  REF  3  LAST  905   16,3136  55'710 1          TS      STRKTTMP

1223  REF  16 LAST  905   16,3137  25'661 1  STRKTCPY INCR    TVCEXPHS        RESTART-PROTECT THE COPYCYCLE        (9)
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1224   REF   4  LAST  905   16,3140  31'710 C            CAE    STRKTIMP
1225   REF   5  LAST  905   16,3141  55'664 C            TS     STRKTIME

1226   REF 156  LAST  898   16,3142  3 4714 1  TVCEXFIN  CAF    ZERO          RESET TVCEXPHS
1227   REF  17  LAST  905   16,3143  55'661 C            TS     TVCEXPHS

1228   REF  45  LAST  784   16,3144  1 5213 C            TCF    TASKOVER      OVER AND OUT
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P1229   NAME     S40.15 INERTIA COMPUTATIONS
 1230   REF   2  LAST  102   E6,1650                          EBANK= 1/CONACC

 1231   REF   3  LAST  688   16,3145  31'470 C  S40.15  CAE     IXX          COMPUTE 1/CONACC (RACC)....IXX SC.AT
 1232                        16,3146  0 0006 1          EXTEND                    B+20  KG M SQD
 1233   REF   1              16,3147  7 3164 C          MP      2PI/M        2PI/M, SC.AT  1/(B+8 N M)
 1234                        16,3150  20 001 1          DDOUBL
 1235                        16,3151  20 001 1          DDOUBL
 1236                        16,3152  20 001 1          DDOUBL
 1237   REF   3  LAST  907   16,3153  55'650 1          TS      1/CONACC     SC.AT  B+9  SEC SQD / REV

 1243   REF   5  LAST  904   16,3154  31'646 1    +7    CAE     KTLX/I       COMPUTE VARK, SCALING IN THE KTLX/I FOR
 1244                        16,3155  0 0006 1          EXTEND                    LM-OFF,ON. ENTRY FROM SWITCHOVER
 1245   REF   1              16,3156  7 1472 C          MP      IAVG/TLX          SCALED AT B+2  SECONDS-SQUARED
 1246                        16,3157  20 001 1          DDOUBL                    SCALING
 1247                        16,3160  20 001 1          DDOUBL
 1248                        16,3161  20 001 1          DDOUBL
 1249   REF   3  LAST  103   16,3162  55'651 C          TS      VARK              LEM-OFF KPGEN3(0) OR LEM-ON VARK(0)

 1250   REF 178  LAST  839   16,3163  0 0002 C          TC      Q

 1251                        16,3164   33074 1  2PI/M    DEC     .00331017 B+8    2PI/M, SC.AT 1/(B+8 N M)
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L TVCMASSPROP USER'S PAGE NO. 1 EO S3

R1000 PROGRAM NAME....MASSPROP
R1001 LOC SECTION....TVCMASSPROP PROGRAMMER...MELANSON (ENGEL, SCHLUNDT)

R1002 FUNCTIONAL DESCRIPTION:

R1003 MASSPROP OPERATES IN TWO MODES:(1)IF LEM MASS OR CONFIGURATION ARE UPDATED (MASSPROP DOES NOT TEST
R1005 FOR THIS) THE ENTIRE PROGRAM MUST BE RUN THROUGH, BREAKPOINT VALUES AND DERIVATIVES OF THE OUTPUTS WITH
R1007 RESPECT TO CSM MASS BEING CALCULATED PRIOR TO CALCULATION OF THE OUTPUTS. (2)OTHERWISE, THE OUTPUTS CAN BE
R1009 CALCULATED USING PREVIOUSLY COMPUTED BREAKPOINT VALUES AND DERIVATIVES.

R1009S CALLING SEQUENCES

R1010 IF LEM MASS OR CONFIGURATION HAS BEEN UPDATED, TRANSFER TO MASSPROP, OTHERWISE TRANSFER TO FIXCW.
R1012 L TC BANKCALL OR IBNKCALL
R1013 L+1 CADR MASSPROP
R1014 OR
R1015 L+1 CADR FIXCW

R1016 L+2 RETURNS VIA Q

R1017 CALLED IN PARTICULAR BY DONGUN47 (JOB) AND TVCEXECUTIVE (TASK)

R1019 JOBS OR TASKS INITIATED - NONE

R1020 SUBROUTINES CALLED - NONE

R1021 ERASABLE INITIALIZATION REQUIRED

R1022 LEMMASS MUST CONTAIN LEM MASS SCALED AT B+16 IN KILOGRAMS
R1023 CSMMASS MUST CONTAIN CSM MASS SCALED AT B+16 IN KILOGRAMS

R1024 CADCATR1 MUST BE SET TO INDICATE VEHICLE CONFIGURATION.
R10241 BITS (15,14,13) = (0 , 0 , 1) LEM OFF
R102411 (0 , 1 , 0) LEM ON (ASCNT,DSCNT)
R102412 (1 , 1 , 0) LEM ON (ASCNT ONLY)

R1025 ALARMS - NONE

R1026 EXIT - TC Q

R1027 OUTPUTS:

R1028 (1)IXX, SINGLE PRECISION SCALED AT B+20 IN KG-M SQ.
R1029 (2)IAVG, SINGLE PRECISION SCALED AT B+20 IN KG-M SQ.
R1030 (3)IAVG/TLX, SINGLE PRECISION, SCALED AT B+2 SEC-SQD
R1031 THEY ARE STORED IN CONSECUTIVE REGISTERS IXX0, IXX1, IXX2

R10311 CONVERSION FACTOR : (SLUG-FTSQ) = 0.737562 (KG-MSQ)

R1032 OUTPUTS ARE CALCULATED AS FOLLOWS :

R1033 (1) IF LEM DOCKED, LEMMASS IS FIRST ELIMINATED AS A PARAMETER

R1034	VARST0 = INTVALUE0 + LEMMASS(SLOPEVAL0)	IXX	BREAKPOINT VALUE
R1036	VARST1 = INTVALUE1 + LEMMASS(SLOPEVAL1)	IAVG	BREAKPOINT VALUE
R1038	VARST2 = INTVALUE2 + LEMMASS(SLOPEVAL2)	IAVG/TLX	BREAKPOINT VALUE
R1040	VARST3 = INTVALUE3 + LEMMASS(SLOPEVAL3)	IAVG/TLX	SLOPE FOR CSMMASS > 33956 LBS (SPS > 10000 LBS)
R1042	VARST4 = INTVALUE4 + LEMMASS(SLOPEVAL4)	IAVG	SLOPE FOR CSMMASS > 33956 LBS (SPS > 10000 LBS)
R1044	VARST5 = INTVALUE5 + LEMMASS(SLOPEVAL5)	IXX	SLOPE FOR ALL VALUES OF CSMMASS
R1046	VARST6 = INTVALUE6 + LEMMASS(SLOPEVAL6)	IAVG	SLOPE FOR CSMMASS < 33956 LBS (SPS < 10000 LBS)
R1048	VARST7 = INTVALUE7 + LEMMASS(SLOPEVAL7)	IAVG/TLX	SLOPE FOR CSMMASS < 33956 LBS (SPS < 10000 LBS)
R1050	VARST8 = INTVALUE8 + LEMMASS(SLOPEVAL8)	IAVG	DECREMENT TO BRKPT VALUE WHEN LEM DSCNT STAGE OFF
R1052	VARST9 = INTVALUE9 + LEMMASS(SLOPEVAL9)	IAVG/TLX	DECREMENT TO BRKPT VALUE WHEN LEM DSCNT STAGE OFF

R1054 (2) IF LEM NOT DOCKED

R1055	VARST0 = NOLEMVAL0	WHERE THE MEANING AND SCALING OF VARST0
R1056	. .	TO VARST9 ARE THE SAME AS GIVEN ABOVE
R1057	. .	
R1058	. .	NOTE... FOR THIS CASE, VARST8,9 HAVE NO
R1059	VARST9 = NOLEMVAL9	MEANING (THEY ARE COMPUTED BUT NOT USED)

R1060 (3) THE FINAL OUTPUT CALCULATIONS ARE THEN DONE

R1061	IXX0 = VARST0 + (CSMMASS + NEGBPW)VARST5	IXX
R1062	IXX1 = VARST1 + (CSMMASS + NEGBPW)VARST(4 OR 6)	IAVG
R1063	IXX2 = VARST2 + (CSMMASS + NEGBPW)VARST(3 OR 7)	IAVG/TLX

R1064 THE DATA USED CAME FROM CSM/LM SPACECRAFT OPERATIONAL DATA BOOK.
R10641 VOL. 3, NASA DOCUMENT SNA-8-D-027 (MARCH 1968)

R1065	PERTINENT MASS DATA :	CSM WEIGHT	(FULL) 64100 LBS
R1066			(EMPTY) 23956 LBS
R1067		LEM WEIGHT	(FULL) 32000 LBS
R1068			(EMPTY) 14116 LBS

R10681 (WEIGHTS ARE FROM AMENDMENT #1 (APRIL 24,1968) TO ABOVE DATA BOOK)

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1069                          25,3766                    BANK   25
1070   REF   1                05,2000                    SETLOC DAPMASS
1071                          05,3176                    BANK
1072   REF   8  LAST  901     E6,1742                    EBANK= BZERO
1073   REF   1                                          COUNT* $$/MASP

1074   REF   2  LAST  437     05,3176  3 4334 1  MASSPROP CAF    NINE       MASSPROP USES TVC/RCS INTERUPT TEMPS
1075   REF   2  LAST  100     05,3177  55'506 1           TS     PHI333     SET UP TEN PASSES

1076   REF  63  LAST  904     05,3200  31'466 1  LEMTEST  CAE    DAPDATR1   DETERMINE LEM STATUS
1077   REF  37  LAST  904     05,3201  7 4676 C           MASK   BIT13
1078                          05,3202  0 0006 1           EXTEND
1079   REF   1                05,3203  1 3207 C           BZF    LEMYES

1080   REF   3  LAST  910     05,3204  51'506 C  LEMNO    INDEX  PHI333     LEM NOT ATTACHED
1081   REF   1                05,3205  3 3273 1           CAF    NOLEMVAL
1082   REF   1                05,3206  1 3217 1           TCF    STOINST

1083   REF   5  LAST  272     05,3207  31'473 C  LEMYES   CAE    LEMMASS    LEM IS ATTACHED
1084                          05,3210  6 0000 1           DOUBLE
1085                          05,3211  0 0006 1           EXTEND
1086   REF   4  LAST  910     05,3212  5 1506 C           INDEX  PHI333
1087   REF   1                05,3213  7 3315 1           MP     SLOPEVAL
1088                          05,3214  20 001 1           DDOUBL
1089   REF   5  LAST  910     05,3215  51'506 C           INDEX  PHI333
1090   REF   1                05,3216  6 3303 1           AD     INTVALUE

1091   REF   6  LAST  910     05,3217  51'506 C  STOINST   INDEX  PHI333     STORAGE INST BEGIN HERE
1092   REF   3  LAST  100     05,3220  55'511 1           TS     VARSTO
1093   REF   7  LAST  910     05,3221  11'506 1           CCS    PHI333     ARE ALL TEN PASSES COMPLETED
1094   REF   5  LAST  897     05,3222  1 3177 1           TCF    MASSPROP +1  NO - GO DECREMENT PHI333

1098   REF  64  LAST  910     05,3223  11'466 C  DXTEST   CCS    DAPDATR1   IF NEG, BIT15 IS 1, LEM DSCNT STAGE OFF
1099   REF   2  LAST  902     05,3224  1 3232 C           TCF    FIXCW
1100   REF   3  LAST  910     05,3225  1 3232 C           TCF    FIXCW
1101   REF   4  LAST  910     05,3226  53'522 1           DXCH   VARSTO +8D
1102   REF   5  LAST  910     05,3227  21'513 C           DAS    VARSTO +1
1103   REF   1                05,3230  3 3330 1           CA     DXITFIX
1104   REF   6  LAST  910     05,3231  27'520 C           ADS    VARSTO +7

1105   REF  35  LAST  897     05,3232  3 4711 1  FIXCW    CAF    BIT2       COMPUTATION PHASE BEGINS HERE.  SET UP
1106   REF   8  LAST  910     05,3233  55'506 1           TS     PHI333     THREE PASSES
1107   REF   2  LAST  100     05,3234  55'507 C           TS     PSI333

1108   REF  16  LAST  902     05,3235  31'474 1           CAE    CSMMASS    GET DELTA CSM WEIGHT - SIGN DETERMINES
1109   REF   1                05,3236  6 3327 1           AD     NEGBPW     SLOPE LOCATIONS.
1110                          05,3237  6 0000 1           DOUBLE
1111   REF   2  LAST  100     05,3240  55'510 C           TS     TEMP333
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1112                          05,3241  0 0006 1          EXTEND
1113  REF   1                 05,3242  6 3245 1          BZMF    PEGGY          DETERMINE CORRECT SLOPE
1114  REF   3  LAST  314      05,3243  3 7715 C          CAF     NEG2
1115  REF   9  LAST  91C      05,3244  55'506 1          TS      PHI333

1116  REF  10  LAST  911      05,3245  51'506 C  PEGGY    INDEX   PHI333          ALL IS READY - CALCULATE OUTPUTS NOW
1117  REF   1                 05,3246  31'516 1          CAE     VARST5         GET SLOPE
1118                          05,3247  0 0006 1          EXTEND
1119  REF   3  LAST  91C      05,3250  7 1510 C          MP      TEMP333        MULT BY DELTA CSM WEIGHT
1120                          05,3251  6 0000 1          DOUBLE
1121  REF   3  LAST  91C      05,3252  51'507 1          INDEX   PSI333
1122  REF   7  LAST  91C      05,3253  6 1511 C          AD      VARST0         ADD BREAKPOINT VALUE
1123  REF   4  LAST  911      05,3254  51'507 1          INDEX   PSI333
1124  REF   4  LAST  907      05,3255  55'47C 1          TS      IXX            ****** OUTPUTS (IXX0, IXX1, IXX2) ******

1125  REF   5  LAST  911      05,3256  11'507 C          CCS     PSI333         BOOKKEEPING - MASSPROP FINISHED OR NOT
1126  REF   1                 05,3257  1 3267 C          TCF     BOKKEP2        NO - GO TAKE CARE OF INDEXING REGISTERS

1127  REF  65  LAST  91C      05,3260  31'466 1          CAE     DAPDATR1       UPDATE WEIGHT/G
1128  REF  45  LAST  897      05,3261  7 4675 C          MASK    BIT14
1129  REF 196  LAST  903      05,3262  1C 000 C          CCS     A
1130  REF   6  LAST  91C      05,3263  3 1473 C          CA      LEMMASS
1131  REF  17  LAST  91C      05,3264  6 1474 1          AD      CSMMASS
1132  REF   9  LAST  846      05,3265  55'475 1          TS      WEIGHT/G       SCALED AT B+16 IN KILOGRAMS
1133  REF 179  LAST  907      05,3266  0 0002 C  ENDMASSP TC      Q

1134  REF   6  LAST  911      05,3267  55'507 C  BOKKEP2  TS      PSI333         REDUCE PSI BY ONE
1135                          05,3270  0 0006 1          EXTEND
1136  REF  11  LAST  911      05,3271  27'506 1          DIM     PHI333
1137  REF   2  LAST  911      05,3272  1 3245 C          TCF     PEGGY
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1138                05,3273   00616 0  NOLEMVAL DEC     25445. B-20
1139                05,3274   02526 1           DEC     87450. B-20
1140                05,3275   02352 1           DEC     .30715 B-2
1141                05,3276   01471 1           DEC     1.22877 E-5 B+12
1142                05,3277   00634 0           DEC     1.6096 B-6
1143                05,3300   00612 1           DEC     1.54 B-6
1144                05,3301   03706 0           DEC     7.77177 B-6
1145                05,3302   04425 0           DEC     3.46458 E-5 B+12

1146                05,3303   00644 1  INTVALUE DEC     26850 B-20
1147                05,3304   03710 1           DEC     127518 B-20
1148                05,3305   04246 0           DEC     .54059 B-2
1149                05,3306   02011 0           DEC     .153964 E-4 B+12
1150                05,3307   77501 0           DEC     -.742923 B-6
1151                05,3310   00612 1           DEC     1.5398 B-6
1152                05,3311   04656 0           DEC     9.68 B-6
1153                05,3312   10372 0           DEC     .647625 E-4 B+12
1154                05,3313   77126 1           DEC     -27228. B-20
1155                05,3314   76261 0           DEC     -.206476 B-2

1156                05,3315   00767 1  SLOPEVAL DEC     1.96307 B-6
1157                05,3316   15624 0           DEC     27.5774 B-6
1158                05,3317   03054 0           DEC     2.3548 E-5 B+12
1159                05,3320   04532 1           DEC     2.1777 E-9 B+26
1160                05,3321   10433 1           DEC     1.044 E-3 B+8
1161                05,3322   00000 1           DEC     0
1162                05,3323   22070 0           DEC     2.21068 E-3 B+8
1163                05,3324   03204 1           DEC     1.5166 E-9 B+26
1164                05,3325   77266 0           DEC     -1.284 B-6
1165                05,3326   02476 0           DEC     2. E-5 B+12

1166                05,3327   70364 1  NEGBPW   DEC     -15402.17 B-16
1167                05,3330   75420 0  DXITFIX  DEC*    -1.88275 E-5 B+12*
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R1000   NAME....TVCRESTART PACKAGE,  CONSISTING OF REDOTVC, ENABL1, 2, CMDSOUT, PHSCHK2, ETC.
R1002   LCC SECTION....TVCRESTART PACKAGE     SUBROUTINE....DAPCSM
R1003   MCC BY ENGEL                         DATE....19 OCT, 1967

R1004   FUNCTIONAL DESCRIPTION....

R1005       *RESTART-PROOFS THE TVC DAPS, INCLUDING PITCHDAP, YAWDAP,
R1006        TVCEXECUTIVE, ROLL DAP, TVCINIT4, TVCDAPON, AND STROKE TEST
R1007       *TVC RESTARTS DESERVE SPECIAL CONSIDERATION IN SEVERAL AREAS.
R1008        RESTART DOWN-TIME IS IMPORTANT BECAUSE OF THE TRANSIENTS INTRODUCED
R1009        BY THE THRUST VECTOR RETURN TO THE ACTUATOR MECHANICAL NULLS
R1010        FOLLOWING TVC- AND OPTICS-ERROR-COUNTER-DISENABLES (CHANNEL 12).
R1011        TVC    USES A MIXTURE OF WAITLIST, T5, T6, AND JOB CALLS. THERE IS
R1012        FILTER MEMORY (UP TO 7TH ORDER) TO BE PROTECTED IF WILD TRANSIENTS
R1013        ARE TO BE AVOIDED. SEVERAL COUNTERS ARE INVOLVED FOR TIMING TVC
R1014        EVENTS SUCH AS SWITCHOVER AND STROKE TEST STARTUPS AND RE-STARTUPS.
R1015        THE TVC GAINS ARE DECREMENTED. THE GIMBAL TRIM ESTIMATORS AND THE
R1016        BODY AXIS ATTITUDE ERROR INTEGRATORS INVOLVE DIGITAL SUMMATION.
R1017        DIGITAL DIFFERENTIATORS ARE INVOLVED IN THE BODY AXIS RATE ESTIMA-
R1018        TIONS AND IN THE OUTPUTTING OF ACTUATOR COMMANDS. THERE IS AN
R1019        OFFSET-TRACKER-FILTER TO PROTECT, ETC., ETC.
R1020       *THOSE QUANTITIES WHICH MUST BE PROTECTED ARE STORED IN TEMPORARY
R1021        REGISTERS AS THEY ARE COMPUTED, FOR UPDATING THE REAL REGISTERS
R1022        DURING COPYCYCLES.
R1023       *THE SEVERAL COPYCYCLES ARE EACH PROTECTED BY PHASE POINTS AT THEIR
R1024        BEGINNING AND AT THEIR TERMINATION. THE PHASE POINTS ARE SIMPLY
R1025        ..INCR.. INSTRUCTIONS,  EITHER ..INCR TVCEXPHS.. FOR COPYCYCLES
R1026        IN THE TVCEXECUTIVE, OR ..INCR TVCPHASE.. FOR THE PITCH AND YAW
R1027        COPYCYCLES. INDEXING ON EACH OF THESE POINTERS THEN PERMITS A
R1028        RETURN TO THE APPROPRIATE RESTART POINTS.
R1029       *IF A RESTART OCCURS DURING EITHER COPYCYCLE, THAT COPYCYCLE IS
R1030        COMPLETED. THEN THE NORMAL TVCINIT4....DAPINIT....PITCHDAP STARTUP
R1031        SEQUENCE IS CALLED UPON TO GET THINGS GOING AGAIN.
R1032       *TVC-ENABLE AND OPTICS-ERROR-COUNTER ENABLE MUST BE SET ASAP
R1033        (ALLOWING FOR PROCEDURAL DELAYS). THEN THE ENGINES ARE COMMANDED
R1034        TO THE P,YACTOFF TRIM VALUES. THE DAPS ARE THEN READY TO GO ON THE
R1035        AIR, WITH THE REGULAR STARTUP SEQUENCE, EITHER AT MRCLEAN FOR A
R1036        COMPLETE INITIALIZATION OR AT TVCINIT4 FOR A PARTIAL INITIALIZATION
R1037       *FOR RESTARTS PRIOR TO THE SETTING OF THE T5 BITS IN IGNOVER THE
R1038        PRE40.6 SECTION OF S40.6 TAKES CARE OF RE-ESTABLISHING TRIMS.
R1039       *IF A RESTART OCCURS DURING THE TVCEXEC....TVCEXFIN SEQUENCE THE
R1040        COMPUTATIONS WILL BE COMPLETED, STARTING AT THE APPROPRIATE RESTART
R1041        POINT, AFTER THE DAPS ARE READY TO GO ON THE AIR.
R1042       *IF A RESTART OCCURS PRIOR TO TVCINIT4 (TVCPHASE = -1) E.G. DURING
R1043        THE EARLY DAP INITIALIZATION PHASE, THE DAP STARTUP SEQUENCE IS
R1044        ENTERED AT MRCLEAN FOR A FULL INITIALIZATION.
R1045       *RESTARTS ARE NOT CRITICAL TO THE ROLL DAP PERFORMANCE$ HENCE THE
R1046        THE ROLL DAP IS MERELY RESTARTED.
R1050       *RESTARTS DURING A STROKE TEST (STROKER IS NON-ZERO) WILL CAUSE THE
R1051        STROKE TEST TO BE TERMINATED. A NEW V68 ENTRY WILL BE REQUIRED
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R1052          TO GET IT GOING AGAIN (NO AUTOMATIC RESTART).
R1054         *REDOTVC IS REACHED FOLLOWING ANY RESTART WHICH FINDS THE T5 BITS
R1055          (BITS 15,14 OF FLAGWRD6) SET FOR TVC. IGNOVER PREPARES TVCPHASE =-1
R1056          AND TVC EXPHS = 0 JUST BEFORE SETTING THESE BITS, JUST BEFORE
R1057          MAKING THE T5 CALL TO TVCDAPON.  T.V.N.G. TAKES OVER THE T5 CLOCK
R1058          TO CALL RCSUP/RCSDAPON WHICH RESETS THE T5 BITS(FOR RCS) ON A
R1059          NORMAL SHUTDOWN.

R1060   CALLING SEQUENCE....T5, IN PARTICULAR BY ELRSKIP OF FRESH START/RESTART

R1061   NORMAL EXIT MODES....RESUME, NOQRSM, POSTJUMP (TO TVCINIT4 OR MRCLEAN)

R1062   ALARM OR ABORT EXIT MODES....NONE

R1063   SUBROUTINES CALLED....

R1064          *PCOPY+1, YCOPY+1 (PITCH AND YAW COPYCYCLES)
R1065          *ENABLE1,2, CMDSOUT (RE-ESTABLISH ACTUATOR TRIMS)
R1067          *MRCLEAN OR TVCINIT4 (TVCDAP INITIALIZATIONS)
R1068          *EXRSTRT AND TVCEXECUTIVE PHASE POINTS 1 THRU 9
R1069          *WAITLIST, IBNKCALL, POSTJUMP, ISWCALL

R1070   OTHER INTERFACES....IGNOVER AND RCSDAPON (T5 BITS), ELRSKIP (CALLS IT)

R1071   ERASABLE INITIALIZATION REQUIRED....

R1072          *15 BITS, TVCPHASE, TVCEXPHS
R1073          *TVC DAP VARIABLES
R1074          *OPERATIONS PERFORMED BY REDOTVC ARE BASED ON THE ASSUMPTION THAT
R1075           THE TVC DAPS ARE RUNNING NORMALLY

R1076   OUTPUT....

R1077          *PITCH AND YAW TVC DAP COPYCYCLES COMPLETED IF INTERUPTED
R1078          *TVCEXECUTIVE COMPLETED IF INTERUPTED
R1079          *STROKE TEST TERMINATED IF INTERRUPTED
R1080          *ACTUATOR TRIMS RE-ESTABLISHED (ACTUATORS BACK ON THE AIR)
R1081          *TVC DAP INITIALIZATION AS REQUIRED
R1082          *ALL TVC DAP OPERATIONS ON THE AIR

R1083   DERIS....TVC TEMPORARIES IN EBANK6


 1084                                  16,3165                 BANK   16
 1085   REF   2  LAST  901   16,2000                           SETLOC DAPROLL
 1086                                  16,3165                 BANK
 1087   REF   4  LAST  898   E6,1654                           EBANK= TVCPHASE

 1088   REF   1                                                COUNT* $$/RSRT
 1089   REF   9  LAST  897   16,3165  22 016 C  REDOTVC  LXCH   BANKRUPT        TVC RESTART PACKAGE
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1090                            16,3166  0 0006 1           EXTEND
1091   REF   5 LAST  897        16,3167  22 012 1           QXCH    QRUPT          (  ..TCR..  IN  ..FINCOPY..  )

1092   REF  18 LAST  906        16,3170  11'661 0  EXECPHS  CCS     TVCEXPHS       CHECK TVCEXECUTIVE PHASE
1093                            16,3171  1 3173 0           TCF     +2                   MUST RESTART TVCEXECUTIVE
1094   REF   1                  16,3172  1 3177 1           TCF     TVCDAPHS             NO NEED TO RESTART TVCEXECUTIVE

1095   REF   3 LAST  910        16,3173  3 4334 1           CAF     NINE           9CS DELAY TO FORCE EXRSTRT TO OCCUR
1096   REF  43 LAST  901        16,3174  0 5140 1           TC      WAITLIST             BEFORE PITCHDAP, AFTER CMOSOUT
1097   REF  19 LAST  915        E6,1661                     EBANK=  TVCEXPHS
1098   REF   1                  16,3175   03270 1           2CADR   EXRSTRT
1098   REF   1                  16,3176   34066 0

1099   REF   2 LAST  132        16,3177  4 7700 0  TVCDAPHS CS      OCT37776       CHECK BITS 15 AND 1 OF TVCPHASE TO SEE
1100   REF   5 LAST  914        16,3200  7 1654 0           MASK    TVCPHASE             DAP RESTART LOCATION  (-1,1,2,3)
1101   REF 197 LAST  911        16,3201  10 000 0           CCS     A
1102   REF   1                  16,3202  1 3255 1           TCF     FINCOPY              FINISH THE COPYCYCLE FIRST
1103   REF   1                  16,3203  1 3205 1           TCF     ENABL1               JUST PREPARE THE OUTCOUNTERS AND GO
1104   REF   1                  16,3204  1 3261 0           TCF     TRIM/CMD             (RE-)DO P,YCMD INITIALIZATION FIRST

1105   REF  24 LAST  609        16,3205  3 4703 1  ENABL1   CAF     BIT8           TVC ENABLE, FOLLOWED BY 40 MS (MIN) WAIT
1106                            16,3206  0 0006 1           EXTEND                       (ENABL1 ENTRIES..+0,- CCS, FINCOPY)
1107   REF  31 LAST  687        16,3207  05 012 1           WOR     CHAN12
1108   REF   1                  16,3210  3 3274 0           CAF     TVCADDR        WAIT,  CALLING ENABL2  (BBCON THERE)
1109   REF  14 LAST  899        16,3211  55'312 1           TS      T5LOC
1110   REF   2 LAST  915        16,3212  3 3300 1           CAF     TVCADDR +4           60MS  (TVCEXADR)
1111   REF  10 LAST  899        16,3213  54 030 0           TS      TIME5

1112   REF  30 LAST  899        16,3214  1 5222 1           TCF     RESUME

1113   REF  10 LAST  914        16,3215  22 016 0  ENABL2   LXCH    BANKRUPT       CONTINUE PREPARATION OF OUTCOUNTERS

1114   REF  36 LAST  910        16,3216  3 4711 1           CAF     BIT2           OPTICS ERROR CNTR ENABLE, 4MS MIN WAIT
1115                            16,3217  0 0006 1           EXTEND
1116   REF  32 LAST  915        16,3220  05 012 1           WOR     CHAN12
1117   REF   3 LAST  915        16,3221  3 3276 1           CAF     TVCADDR +2     WAIT, CALLING CMDSOUT (BBCON THERE)
1118   REF  15 LAST  915        16,3222  55'312 1           TS      T5LOC
1119   REF   3 LAST  915        16,3223  3 7700 1           CAF     OCT37776             20MS
1120   REF  11 LAST  915        16,3224  54 030 0           TS      TIME5

1121   REF   2 LAST  187        16,3225  1 5224 1           TCF     NOQRSM

1122   REF  11 LAST  915        16,3226  22 016 0  CMDSOUT  LXCH    BANKRUPT       CONTINUE PREPARATION OF OUTCOUNTERS
1123                            16,3227  0 0006 1           EXTEND
1124   REF  10 LAST  915        16,3230  22 012 1           QXCH    QRUPT
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1125  REF 157  LAST  906  16,3231  4 4714 C          CS    ZERO      MOST RECENT ACTUATOR COMMANDS
1126  REF   5  LAST  898  16,3232  6 1631 1          AD    PCMD        (AVOID +0)
1127  REF   3  LAST  684  16,3233  54 054 1          TS    TVCPITCH
1128  REF 158  LAST  916  16,3234  4 4714 C          CS    ZERO
1129  REF   3  LAST  898  16,3235  6 1632 1          AD    YCMD
1130  REF   2  LAST  684  16,3236  54 053 C          TS    TVCYAW

1131  REF   3  LAST  684  16,3237  3 4755 1          CAF   PRIO6     RELEASE THE COUNTERS (BITS 11,12)
1132                      16,3240  0 0006 1          EXTEND
1133  REF   8  LAST  684  16,3241  05 014 1          WOR   CHAN14

1138  REF   6  LAST  915  16,3242  4 1654 C  PHSCHK2  CS    TVCPHASE  CHECK TVCPHASE AGAIN
1139                      16,3243  0 0006 1          EXTEND
1140                      16,3244  6 3247 C          BZMF  +3
1141  REF  48  LAST  825  16,3245  0 4574 C          TC    POSTJUMP    IF NEGATIVE, RESTART AT MRCLEAN
1142  REF   2  LAST  896  16,3246   36035 1          CADR  MRCLEAN       FOR FULL INITIALIZATION

11421 REF   5  LAST  905  16,3247  11'614 1  CHKSTRK  CCS   STROKER   CHECK FOR STROKE TEST IN PROGRESS
11422 REF   1              16,3250  1 3265 1          TCF   TSTINITJ  YES, KILL IT
11423                      16,3251  1 3253 1          TCF   +2        NO, PROCEED
11424 REF   2  LAST  916  16,3252  1 3265 1          TCF   TSTINITJ  YES, KILL IT

1143  REF  49  LAST  916  16,3253  0 4574 C    +4    TC    POSTJUMP    IF POSITIVE OR ZERO, RESTART AT
1144  REF   1              16,3254   36162 1          CADR  TVCINIT4      TVCINIT4 (ZEROS TVCPHASE, AND
A1145                                                                  CALLS TVC DAPS)

1146  REF   7  LAST  916  16,3255  51'654 1  FINCOPY  INDEX  TVCPHASE  PICK UP THE APPROPRIATE COPYCYCLE
1147  REF   1              16,3256  3 3274 0          CAF   TVCCADR
1148  REF   1              16,3257  0 4637 1          TCR   ISWCALL   RE-ENTER THE COPYCYCLE, RETURN AT END
1149  REF   2  LAST  915  16,3260  1 3205 1          TCF   ENABL1    NOW PREPARE THE OUTCOUNTERS

1150                      16,3261  0 0006 1  TRIM/CMD EXTEND          TVCDAPON INITIALIZATION NOT COMPLETED,
1151  REF  19  LAST  905  16,3262  3 1426 C          DCA   PACTOFF       EG.  P,YCMD MAY NOT BE SET.  SET...
1152  REF   6  LAST  916  16,3263  53'632 C          DXCH  PCMD
1153  REF   3  LAST  916  16,3264  1 3205 1          TCF   ENABL1    NOW PREPARE THE OUTCOUNTERS

1154  REF 159  LAST  916  16,3265  3 4714 1  TSTINITJ CAF   ZERO      DISABLE STROKE TEST (-0 SHOWS PRIOR V68)
1155  REF   6  LAST  916  16,3266  55'614 1          TS    STROKER   (+0 MEANS NEW V68 REQUIRED FOR STARTUP)

11552 REF   1              16,3267  1 3253 1          TCF   CHKSTRK +4

1161  REF  20  LAST  915  16,3270  51'661 1  EXRSTRT  INDEX  TVCEXPHS  TVCEXECUTIVE RESTARTS....GO TO
1162  REF   1              16,3271  3 3300 1          CAF   TVCEXADR      APPROPRIATE RESTART POINT
1163  REF 198  LAST  915  16,3272  50 000 1          INDEX A
1164                      16,3273  1 0000 0          TCF   0
```

R1165 TVC RESTART TABLES.... ORDER IS REQUIRED. HI-ORDER WORDS ONLY, OF 2CADRS, SINCE BBCON IS ALREADY THERE.

```
1167  REF  2 LAST 916  16,3274          TVCADDR  =       TVCCADR     TABLE OF CADRS, UNUSED LOCS FOR GENADRS
1168  REF  1           16,3274  03215 1 TVCCADR  GENADR  ENABL2      (FOR T5 CALL, UNUSED TABLE LOC)
1169  REF  1           16,3275  40545 1   +1     CADR    PCOPY +1    PITCH COPYCYCLE
1170  REF  1           16,3276  03226 1   +2     GENADR  CMDSCUT     (FOR T5 CALL, UNUSED TABLE LOC)
1171  REF  1           16,3277  41023 C   +3     CADR    YCOPY +1    YAW COPYCYCLE
1172                   16,3300  37772 1 TVCEXADR OCT     37772       (UNUSED TABLE LOC, FILL WITH 60MS, T5)
1173  REF  2 LAST 902  16,3301  02742 1   +1     GENADR  EXECCOPY +1 TVCEXECUTIVE RESTART POINTS (ORDERED)
1174  REF  2 LAST 902  16,3302  02750 1   +2     GENADR  SWT/COR
1175  REF  1           16,3303  03030 1   +3     GENADR  SWTCOPY +1
1176  REF  2 LAST 903  16,3304  03050 1   +4     GENADR  TEMPSET
1177  REF  2 LAST 903  16,3305  03053 1   +5     GENADR  CORSETUP
1178  REF  1           16,3306  03111 C   +6     GENADR  CORCOPY +1
1179  REF  2 LAST 903  16,3307  03122 C   +7     GENADR  CNTRCOPY
1180  REF  2 LAST 903  16,3310  03125 1   +8D    GENADR  STRKLP
1181  REF  2 LAST 905  16,3311  03140 1   +9D    GENADR  STRKTCPY +1
```

R1000 PROGRAM NAME....TVCDAP, CONSISTING OF PITCHDAP, YAWDAP, ETC.
R1001 LOC SECTION....TVCDAP SUBROUTINE....DAPCSM
R1002 MOD BY ENGEL DATE....27 OCT, 1967

R1003 FUNCTIONAL DESCRIPTION....

R1004 SELF-PERPETUATING T5 TASKS WHICH GENERATE THE COMMAND SIGNALS
R1005 FOR THE PITCH AND YAW SPS GIMBAL ACTUATORS DURING TVC (SPS) BURNS,
R1006 IN RESPONSE TO BODY-AXIS RATE COMMANDS FROM CROSS-PRODUCT STEERING
R1007 (S40.8). IF NO STEERING (IMPULSIVE BURNS) MAINTAINS ATTITUDE-HOLD
R1008 ABOUT THE REFERENCE (INITIAL) DIRECTIONS (ZERO RATE COMMANDS).

R1009 THE PITCH AND YAW LOOPS ARE SEPARATE, BUT STRUCTURED IDENTICALLY.
R1010 EACH ATTITUDE-RATE LOOP INCLUDES GIMBAL ANGLE RATE DERIVATION,
R1011 GIMBAL/BODY AXIS TRANSFORMATION, BODY-AXIS ATTITUDE ERROR
R1012 INTEGRATION WITH ERROR LIMITING, THE CSM/LEM FILTER OR THE BRANCH
R1013 POINTS FOR THE CSM-ALONE (GEN3DAP) FILTER, OUTPUT LIMITER,
R1014 CG-OFFSET TRACKER FILTER, AND THE CG-TRACKER MINOR LOOP.

R1015 THE DAPS ARE CYCLIC, CALLING EACH OTHER AT 1/2 THE DAP SAMPLE
R1016 TIME, AS DETERMINED BY TSTVCDT. THE ACTUATOR COMMANDS ARE
R1017 REGENERATED AS ANALOG VOLTAGES BY THE OPTICS ERROR COUNTERS, WHICH
R1018 TRANSMIT THE SIGNAL TO THE ACTUATOR SERVOS WHEN THERE IS PROPER CDU
R1019 ACCING.

R1020 REFERENCES FOR THE CSM/LEM FILTER DESIGN INCLUDE R503 BY STUBBS
R1021 (MIT IL OCT 1965) AND SGA MEMO R26-65 BY MARTIN (MIT IL OCT 1965).
R1022 REFERENCES FOR THE CSM FILTER DESIGN (SEE GEN3DAP) INCLUDE R533 BY
R1023 LU (MIT IL JUNE 1966).

R1024 OPERATIONAL ASPECTS OF THE INTEGRATED CONTROL PACKAGE, WITH DESIGN-
R1025 NOMINAL PARAMETER VALUES ARE DISCUSSED IN AG R336-67 BY ENGEL
R1026 (MIT IL OCT 1967) AND SGA MEMO R18-67 BY SCHLUNDT (MIT IL OCT 1967)

R1027 CALLING SEQUENCE.... (TYPICALLY)

R1028 T5 CALL OF TVCDAPON (P40-P47) BY IGNOVER (P40-P47)
R1029 T5 CALL OF DAPINIT BY TVCINIT4 (P40-P47)
R1030 T5 CALL OF DAPINIT BY CAPINIT
R1031 T5 CALL OF PITCHDAP BY DAPINIT
R1032 T5 CALL OF YAWDAP BY PITCHDAP
R1033 T5 CALL OF PITCHDAP BY YAWDAP
R1034 ETC.
R1035 (AUTOMATIC SEQUENCING FROM TVCDAPON)

R1036 NORMAL EXIT MODE....RESUME

R1037 ALARM OR ABORT EXIT MODES....NONE

R1038 SUBROUTINES CALLED....

```
R1039           HACK FOR STROKE TEST (V68) WAVEFORM GENERATION
R1040           NP0-, NP1-, NY0-, AND NY1NODE FOR GEN3DAP (LEM-OFF) FILTERS
R1041           PCOPY, YCOPY FOR COPY-CYCLES (USED ALSO BY TVC RESTART PACKAGE)
R1042           DAPINIT FOR INITIAL CDUS FOR RATE MEASUREMENTS
R1043           ERRORLIM, ACTLIM FOR INPUT (ATTITUDE-ERROR INTEGRATION) AND
R1044                OUTPUT (ACTUATOR COMMAND) LIMITING, COMMON TO PITCH AND
R1045                YAW DAPS
R1046           OPTVARK, NSUM, DSUM FOR CSM/LEM FILTER OPERATIONS, COMMON TO
R1047                PITCH AND YAW DAPS
R1048           RESUME

R1049   OTHER INTERFACES....

R1050       S40.8 CROSS-PRODUCT STEERING FOR BODY AXIS RATE  COMMANDS OMEGAY,ZC
R1051       S40.15 FOR THE INITIAL DAP GAINS KP/KPDN (LEM-ON) OR KPGEN3 (-OFF)
R1052       TVCEXECUTIVE  FOR VARIABLE DAP GAINS, FILTER SAMPLE-RATE CHANGE AND
R1053           GAIN REDUCTION AT LEM-ON SWITCHOVER, SINGLE-SHOT CG. ESTIMATION
R1054           AT SWITCHOVER AND REPETITIVE CG ESTIMATION AFTER SWITCHOVER.
R1055       TVCRESTART PACKAGE FOR TVC RESTART PROTECTION.

R1056   ERASABLE INITIALIZATION REQUIRED....

R1057       29 PAD-LOAD ERASABLES ESTRCKER.....EREPFRAC +1
R1058       KP/KPDN  (KPGEN3)  AS IN S40.15  (R03)
R1059       CONFIGURATION BITS  (14, 13)  OF DAPDATR1 AS IN R03
R1060       ENGINE-ON BIT (11.13) FOR RESTARTS
R1061       TVCPHASE FOR RESTARTS  (SEE IGNOVER, AND TVCINIT4)
R1062       15 BITS (15,14 OF FLAGWRD6) FOR RESTARTS
R1063       MISCELLANEOUS VARIABLES SET UP OR COMPUTED BY TVCDAPON....TVCINIT4,
R1064            INCLUDING THE ZEROING OF 64 TEMPORARIES BY MRCLEAN
R1065       CDUX,Y,Z AND SINCDUX.... COSCDUX AS PREPARED BY CDUTRIG1 (WITH
R1066           UPDATES EVERY 1/2 SECOND)
R1067       ALSO G+N PRIMARY, TVC ENABLE, AND OPTICS ERROR COUNTER ENABLE
R1068           UNLESS BENCH-TESTING.

R1069   OUTPUT....

R1070       TVCPITCH AND TVCYAW WITH COUNTER RELEASE (11.14 AND 11.13 INCREMEN-
R1071           TAL  COMMANDS TO OPTICS ERROR COUNTERS), FILTER NODES, BODY-
R1072           AXIS ATTITUDE ERROR INTEGRATOR, TOTAL ACTUATOR COMMANDS,
R1073           OFFSET-TRACKER-FILTER OUTPUTS, ETC.
R1074   DEBRIS....

R1075       MUCH, SHAREABLE WITH RCS/ENTRY, IN EBANK6 ONLY


 1076                        17,2215                 BANK   17
 1077   REF  1               20,2000                 SETLOC DAPS2
 1078                        20,2326                 BANK
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L TVCDAPS USER'S PAGE NO. 3 E0 S3

1079 REF 9 LAST 91C E6,1742 EBANK= BZERC

1080 REF 1 COUNT* $$/DAPS

P1081 PITCH TVCDAP STARTS HERE....(INCORPORATES CSM/LEM DAP FILTER, MODOR DESIGN)

```
1083  REF  12  LAST  915   20,2326  22 016 C  PITCHDAP LXCH   BANKRUPT      T5 ENTRY, NORMAL OR VIA DAPINIT
1084                       20,2327  0 0006 1            EXTEND
1085  REF  11  LAST  915   20,2330  22 012 1            QXCH   QRUPT

1086  REF   1              20,2331  3 3403 C            CAF    YAWT5         SET UP T5 CALL FOR YAW AUTOPILOT (LOW-
1087  REF  16  LAST  915   20,2332  55'312 1            TS     T5LOC               ORDER PART OF 2CADR ALREADY THERE)
1088  REF   6  LAST  904   20,2333  31'635 C            CAE    T5TVCDT
1089  REF  12  LAST  915   20,2334  54 030 C            TS     TIME5

1090  REF   7  LAST  916   20,2335  11'614 1  PSTROKER CCS    STROKER       (STRKFLG) CHECK FOR STROKE TEST
1091  REF   1              20,2336  0 3471 C            TC     HACK          TEST-START OR TEST-IN-PROGRESS
1092                       20,2337  1 2341 1            TCF    +2            NO-TEST
1093  REF   2  LAST  921   20,2340  0 3471 C            TC     HACK          TEST-IN-PROGRESS

1094  REF   9  LAST  733   20,2341  30 033 1  PCDUDOTS CAE    CDUY          COMPUTE CDUYDOT
1095  REF   2  LAST  102   20,2342  57'655 0            XCH    PCDUYPST            FOR PITCH AUTOPILOT
1096                       20,2343  0 0006 1            EXTEND
1097  REF   3  LAST  921   20,2344  21'655 1            MSU    PCDUYPST
1098  REF   2  LAST  102   20,2345  55'657 C            TS     MCDUYDOT            (MINUS, SC.AT 1/2TVCDT REVS/SEC)

1099  REF  12  LAST  733   20,2346  30 034 0            CAE    CDUZ          COMPUTE CDUZDOT
1100  REF   2  LAST  102   20,2347  57'656 C            XCH    PCDUZPST            FOR PITCH AUTOPILOT
1101                       20,2350  0 0006 1            EXTEND
1102  REF   3  LAST  921   20,2351  21'656 1            MSU    PCDUZPST
1103  REF   2  LAST  102   20,2352  55'660 1            TS     MCDUZDOT            (MINUS, SC.AT 1/2TVCDT REVS/SEC)

1104                       20,2353  0 0006 1  PINTEGRL EXTEND                    COMPUTE INTEGRAL OF BODY-AXIS PITCH-RATE
1105  REF   2  LAST  101   20,2354  3 1616 1            DCA    PERRB               ERROR, SC.AT B-1 REVS
1106  REF   6  LAST  103   20,2355  53'743 1            DXCH   ERRBTMP

1107                       20,2356  0 0006 1            EXTEND
1108  REF   2  LAST  896   20,2357  3 1530 C            DCA    OMEGAYC
1109  REF   7  LAST  921   20,2360  21'743 1            DAS    ERRBTMP

1110  REF   5  LAST  715   20,2361  4 0746 C            CS     COSCDUZ       PREPARE BODY-AXIS PITCH RATE, OMEGAYB
1111                       20,2362  0 0006 1            EXTEND
1112  REF   5  LAST  715   20,2363  7 0750 1            MP     COSCDUX
1113                       20,2364  20 001 1            DDOUBL
1114                       20,2365  0 0006 1            EXTEND
1115  REF   3  LAST  921   20,2366  7 1657 C            MP     MCDUYDOT
1116                       20,2367  20 001 1            DDOUBL
1117  REF   1              20,2370  53'536 1            DXCH   OMEGAYB

1118  REF   3  LAST  921   20,2371  4 1660 1            CS     MCDUZDOT
1119                       20,2372  0 0006 1            EXTEND
1120  REF   5  LAST  715   20,2373  7 0742 1            MP     SINCDUX
1121                       20,2374  20 001 1            DDOUBL
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1122  REF   2  LAST  921   20,2375  21'536 1          DAS    OMEGAYB   (COMPLETED OMEGAYB, SC.AT 1/2TVCDT REVS)

1123                       20,2376  0 0006 1          EXTEND           PICK UP -OMEGAYB (SIGN CHNG, INTEGRATE)
1124  REF   3  LAST  922   20,2377  4 1536 1          DCS    OMEGAYB
1125  REF   8  LAST  921   20,2400  21'743 1          DAS    ERRBTMP

1126  REF   1              20,2401  0 3112 0 PERORLIM TCR    ERRORLIM  PITCH BODY-AXIS-ERROR  INPUT LIMITER

1127  REF  66  LAST  911   20,2402  31'466 1 PIFILJMP CAE    DAPDATR1  CHECK FOR LEM-ON/-OFF
1128  REF  46  LAST  911   20,2403  7 4675 0          MASK   BIT14     (BIT 14 INDICATES LEM IS ON)
1129  REF 199  LAST  916   20,2404  10 000 0          CCS    A
1130                       20,2405  1 2410 1          TCF    +3        USE LEM-ON FILTER
1131  REF  50  LAST  916   20,2406  0 4574 0          TC     POSTJUMP  USE LEM-OFF (GEN3DAP) FILTER
1132  REF   1              20,2407   36215 1          CADR   NPONCDE

1133                       20,2410  0 0006 1 PFORWARD EXTEND           LEM-ON FILTER COMPUTATIONS.
1134  REF   3  LAST  103   20,2411  4 1544 1          DCS    PDSUM     DENOMINATOR TERMS, SC.AT B+0 SPASCREVS
1135  REF   1              20,2412  53'745 1          DXCH   JZERO

1136  REF   9  LAST  922   20,2413  31'742 1          CAE    ERRBTMP   INPUT ERROR,  SC.AT B-1 REVS
1137  REF   3  LAST  103   20,2414  6 1541 0          AD     PNSUM     NUMERATOR TERMS, SC.AT B-1 REVS
1138                       20,2415  0 0006 1          EXTEND
1139  REF   1              20,2416  7 4727 0          MP     KPDN      KPDN, SC.AT B+1 SPASCREV
1140  REF   2  LAST  922   20,2417  21'745 1          DAS    JZERO

1141  REF   4  LAST  922   20,2420  31'542 0          CAE    PNSUM +1
1142                       20,2421  0 0006 1          EXTEND
1143  REF   2  LAST  922   20,2422  7 4727 0          MP     KPDN
1144  REF   3  LAST  922   20,2423  27'745 1          ADS    JZERO +1
1145  REF  82  LAST  898   20,2424  54 001 1          TS     L
1146                       20,2425  1 2427 0          TCF    +2
1147  REF   4  LAST  922   20,2426  27'744 0          ADS    JZERO     (SC.AT B+0 SPASCREV), (JZERO = CMDTMP)

1148                       20,2427  0 0006 1 JZSTORE  EXTEND           PREPARE JZERO FOR DENOMINATOR LADDER
1149  REF   5  LAST  922   20,2430  3 1745 0          DCA    JZERO          SC.AT B+0 SPASCREV
1150                       20,2431  20 001 1          DDOUBL
1151                       20,2432  20 001 1          DDOUBL
1152                       20,2433  20 001 1          DDOUBL
1153  REF   3  LAST  104   20,2434  53'727 0          DXCH   J1TMP          SC.AT B-3 SPASCREV

1154  REF   1              20,2435  0 3125 1 OPTVARKP TCR    OPTVARK   PITCH VARIABLE-GAIN PACKAGE

1155                       20,2436  0 0006 1 POFFSET  EXTEND           SIGN CHANGE IN FORWARD LOOP
1156  REF   6  LAST  104   20,2437  4 1745 1          DCS    CMDTMP         (GEN3DAP RETURNS AT POFFSET)
1157  REF   7  LAST  922   20,2440  53'745 1          DXCH   CMDTMP
1158                       20,2441  0 0006 1          EXTEND           ADD IN DOUBLE-PRECISION CG OFFSETS
1159  REF   5  LAST  905   20,2442  3 1626 1          DCA    PDELOFF
1160  REF   8  LAST  922   20,2443  21'745 1          DAS    CMDTMP

1161  REF   9  LAST  922   20,2444  31'745 0 PROUND   CAE    CMDTMP +1 ROUND UP FOR OUTPUT
1162                       20,2445  6 0000 1          DOUBLE
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1163   REF  83  LAST  922   20,2446  54 0C1 1           TS      L
1164   REF 160  LAST  916   20,2447  3 4714 1           CAF     ZERO
1165   REF  10  LAST  922   20,2450  6 1744 1           AD      CMDTMP

1166   REF   1              20,2451  0 3145 1  PACLIM   TCR     ACTLIM          PITCH ACTUATOR-COMMAND-LIMITER

1167   REF   7  LAST  916   20,2452  4 1631 0  POUT     CS      PCMD            INCREMENTAL PITCH COMMAND
1168   REF  11  LAST  923   20,2453  6 1744 1           AD      CMDTMP
1169   REF   4  LAST  916   20,2454  26 054 1           ADS     TVCPITCH        UPDATE THE ERROR COUNTER (NO RESTART-
A1170                                                                           PROTECT, SINCE ERROR CNTR ZEROED)

1171   REF  24  LAST  837   20,2455  3 4700 1           CAF     BIT11           BIT FOR TVCPITCH COUNT RELEASE
1172                        20,2456  0 0006 1           EXTEND
1173   REF   9  LAST  916   20,2457  05 014 1           WOR     CHAN14
1174   REF  67  LAST  922   20,2460  31'466 1  P2FILJMP CAE     DAPDATR1        CHECK FOR LEM-ON/-OFF
1175   REF  47  LAST  922   20,2461  7 4675 0           MASK    BIT14           (BIT 14 INDICATES LEM IS ON)
1176   REF 200  LAST  922   20,2462  1C 000 0           CCS     A
1177                        20,2463  1 2466 0           TCF     +3              USE LEM-ON FILTER
1178   REF  51  LAST  922   20,2464  0 4574 0           TC      POSTJUMP        USE LEM-OFF (GEN3DAP) FILTER
1179   REF   1              20,2465   36250 0           CADR    NPINCDE

1180   REF  1C  LAST  922   20,2466  31'742 1  BZSTORE  CAE     ERRBTMP         PREPARE BZERO  (UPPER WORD OF ERRBTMP)
1181                        20,2467  6 0000 1           DOUBLE                  FOR NUMERATOR LADDER....SC.AT B-1
1182   REF   3  LAST  104   20,2470  55'717 0           TS      B1TMP           SC.AT B-2 REVS FOR LADDER

1183                        20,2471  0 0006 1  PNLADDER EXTEND                  PREPARE TEMPORARIES, FOR UPDATING PITCH
1184   REF   2  LAST  100   20,2472  3 1546 1           DCA     B1              NUMERATOR LADDER
1185   REF   3  LAST  104   20,2473  53'721 0           DXCH    B2TMP
1186                        20,2474  0 0006 1           EXTEND
1187   REF   2  LAST  101   20,2475  3 1550 0           DCA     B3
1188   REF   3  LAST  104   20,2476  53'723 1           DXCH    B4TMP
1189                        20,2477  0 0006 1           EXTEND
1190   REF   2  LAST  101   20,2500  3 1552 1           DCA     B5
1191   REF   3  LAST  104   20,2501  53'725 1           DXCH    B6TMP

1192   REF   1              20,2502  0 3157 1  PNSUMC   TCR     NSUM            PITCH NUMERATOR SUM

1193                        20,2503  0 0006 1  PDLADDER EXTEND                  PREPARE TEMPORARIES, FOR UPDATING PITCH
1194   REF   2  LAST  101   20,2504  3 1554 1           DCA     J1              DENOMINATOR LADDER
1195   REF   3  LAST  104   20,2505  53'731 1           DXCH    J2TMP
1196                        20,2506  0 0006 1           EXTEND
1197   REF   2  LAST  101   20,2507  3 1556 0           DCA     J2
1198   REF   3  LAST  104   20,2510  53'733 0           DXCH    J3TMP
1199                        20,2511  0 0006 1           EXTEND
1200   REF   2  LAST  101   20,2512  3 1560 0           DCA     J3
1201   REF   3  LAST  104   20,2513  53'735 0           DXCH    J4TMP
1202                        20,2514  0 0006 1           EXTEND
```

```
1203  REF   3  LAST  103   20,2515  3 1562 1          DCA    J4
1204  REF   4  LAST  104   20,2516  53'737 1          DXCH   J5TMP
1205                       20,2517  0 0006 1          EXTEND
1206  REF   3  LAST  103   20,2520  3 1564 1          DCA    J5
1207  REF   3  LAST  104   20,2521  53'741 C          DXCH   J6TMP

1208  REF   1               20,2522  0 3217 C  PDSUMC  TCR    DSUM          PITCH DENOMINATOR SUM

1209  REF  12  LAST  923    20,2523  31'744 1  DELBARP  CAE    CMDTMP        UPDATE PITCH OFFSET-TRACKER-FILTER
1210                       20,2524  0 0006 1          EXTEND                      (GEN3DAP RETURNS AT  ..DELBARP..  )
1211  REF   1               20,2525  7 3404 0          MP     1-E(-AT)
1212  REF   2  LAST  103   20,2526  53'716 1          DXCH   DELBRTMP
1213  REF   5  LAST  904   20,2527  31'621 C          CAE    DELPBAR
1214                       20,2530  0 0006 1          EXTEND
1215  REF   1               20,2531  7 3405 1          MP     E(-AT)
1216  REF   3  LAST  924   20,2532  21'716 1          DAS    DELBRTMP
1217  REF   6  LAST  924   20,2533  31'622 C          CAE    DELPBAR +1
1218                       20,2534  0 0006 1          EXTEND
1219  REF   2  LAST  924   20,2535  7 3405 1          MP     E(-AT)
1220  REF   4  LAST  924   20,2536  27'716 1          ADS    DELBRTMP +1
1221  REF  84  LAST  923   20,2537  54 001 1          TS     L
1222                       20,2540  1 2542 1          TCF    +2
1223  REF   5  LAST  924   20,2541  27'715 1          ADS    DELBRTMP

1224  REF   2  LAST  917   20,2542  0 2544 C  PCOPYCYC TCR    PCOPY         PITCH COPYCYCLE

1225  REF  31  LAST  915   20,2543  1 5222 1  PDAPEND  TCF    RESUME        PITCH DAP COMPLETED
```

P1226 PITCH TVCDAP COPYCYCLE SUBROUTINE (CALLED VIA PITCH TVCDAP OR TVC RESTART PACKAGE)

```
 1228  REF  8 LAST  916   20,2544  25'654 1 PCOPY    INCR    TVCPHASE        RESTART-PROTECT THE COPYCYCLE.
A1229                                                                            NOTE POSSIBLE RE-ENTRY FROM RESTART
A1230                                                                            PACKAGE, SHOULD A RESTART OCCUR
A1231                                                                            DURING PITCH COPYCYCLE.

 1232                       20,2545  0 0006 1 NEWB(S)  EXTEND                    UPDATE PITCH NUMERATOR LADDER FROM
 1233  REF  4 LAST  923    20,2546  3 1720 0          DCA     B1TMP                 TEMPORARIES
 1234  REF  3 LAST  923    20,2547  53'546 C          DXCH    B1
 1235                       20,2550  0 0006 1          EXTEND
 1236  REF  3 LAST  104    20,2551  3 1722 1          DCA     B3TMP
 1237  REF  3 LAST  923    20,2552  53'550 1          DXCH    B3
 1238                       20,2553  0 0006 1          EXTEND
 1239  REF  3 LAST  104    20,2554  3 1724 1          DCA     B5TMP
 1240  REF  3 LAST  923    20,2555  53'552 C          DXCH    B5

 1241                       20,2556  0 0006 1 NEWJ(S)  EXTEND                    UPDATE PITCH DENOMINATOR LADDER FROM
 1242  REF  4 LAST  922    20,2557  3 1727 1          DCA     J1TMP                 TEMPORARIES
 1243  REF  3 LAST  923    20,2560  53'554 C          DXCH    J1
 1244                       20,2561  0 0006 1          EXTEND
 1245  REF  4 LAST  923    20,2562  3 1731 C          DCA     J2TMP
 1246  REF  3 LAST  923    20,2563  53'556 1          DXCH    J2
 1247                       20,2564  0 0006 1          EXTEND
 1248  REF  4 LAST  923    20,2565  3 1733 1          DCA     J3TMP
 1249  REF  3 LAST  923    20,2566  53'560 1          DXCH    J3
 1250                       20,2567  0 0006 1          EXTEND
 1251  REF  4 LAST  923    20,2570  3 1735 1          DCA     J4TMP
 1252  REF  4 LAST  924    20,2571  53'562 C          DXCH    J4
 1253                       20,2572  0 0006 1          EXTEND                    (ALSO NP1TMP,+1 TO NP1,+1)
 1254  REF  5 LAST  924    20,2573  3 1737 C          DCA     J5TMP
 1255  REF  4 LAST  924    20,2574  53'564 C          DXCH    J5

 1256                       20,2575  0 0006 1 PMISC    EXTEND                  MISC....PITCH-RATE-ERROR INTEGRATOR
 1257  REF 11 LAST  923    20,2576  3 1743 C          DCA     ERRBTMP
 1258  REF  3 LAST  538    20,2577  55'477 C          TS      AK1               FOR PITCH NEEDLES, SC.AT B-1 REVS
 1259  REF  3 LAST  921    20,2600  53'616 C          DXCH    PERRB

 1260                       20,2601  0 0006 1          EXTEND                    PITCH NUMERATOR SUM
 1261  REF  4 LAST  103    20,2602  3 1712 1          DCA     NSUMTMP             (ALSO NP2TMP,+1 TO NP2,+1)
 1262  REF  5 LAST  922    20,2603  53'542 1          DXCH    PNSUM

 1263                       20,2604  0 0006 1          EXTEND                    PITCH DENOMINATOR SUM
 1264  REF  4 LAST  103    20,2605  3 1714 1          DCA     DSUMTMP             (ALSO NP3TMP,+1 TO NP3,+1)
 1265  REF  4 LAST  922    20,2606  53'544 1          DXCH    PDSUM

 1266  REF 13 LAST  924    20,2607  31'744 1          CAE     CMDTMP            PITCH ACTUATOR COMMAND
 1267  REF  8 LAST  923    20,2610  55'631 C          TS      PCMD

 1268                       20,2611  0 0006 1          EXTEND                    PITCH OFFSET-TRACKER-FILTER
```

```
1269  REF   6  LAST  924   20,2612  3 1716 C          DCA    DELBRTMP
1270  REF   7  LAST  924   20,2613  53'622 1          DXCH   DELPBAR

1271  REF   9  LAST  925   20,2614  25'654 1          INCR   TVCPHASE      PITCH COPYCYCLE COMPLETED

1272  REF 18C  LAST  911   20,2615  0 0002 C          TC     Q
```

L TVCDAPS USER'S PAGE NO. 10 E6 S3

P1273 YAW TVCDAP STARTS HERE....(INCORPORATES CSM/LEM DAP FILTER, MODOR DESIGN)

```
1275  REF  13  LAST  921   20,2616  22 016 C  YAWDAP   LXCH   BANKRUPT      T5 ENTRY,  NORMAL
1276                       20,2617  0 0006 1            EXTEND
1277  REF  12  LAST  921   20,2620  22 012 1            QXCH   QRUPT

1278  REF   1             20,2621  3 3401 1            CAF    PITCHT5       SET UP T5 CALL FOR PITCH AUTOPILOT (LOW-
1279  REF  17  LAST  921   20,2622  55'312 1            TS     T5LOC               ORDER PART OF 2CADR ALREADY THERE)
1280  REF   7  LAST  921   20,2623  31'635 C            CAE    T5TVCDT
1281  REF  13  LAST  921   20,2624  54 030 C            TS     TIME5

1282  REF   8  LAST  921   20,2625  11'614 1  YSTROKER CCS    STROKER       (STRKFLG) CHECK FOR STROKE TEST
1283  REF   3  LAST  921   20,2626  0 3471 C            TC     HACK          TEST-START  OR  TEST-IN-PROGRESS
1284                       20,2627  1 2631 C            TCF    +2            NO-TEST
1285  REF   4  LAST  927   20,2630  0 3471 C            TC     HACK          TEST-IN-PROGRESS

A1286                                                                       USE BODY RATES FROM PITCHDAP (PCDUDOTS)

1287                       20,2631  0 0006 1  YINTEGRL EXTEND                COMPUTE INTEGRAL OF BODY-AXIS YAW-RATE
1288  REF   2  LAST  101   20,2632  3 1620 1            DCA    YERRB               ERROR, SC.AT B-1 REVS
1289  REF  12  LAST  925   20,2633  53'743 1            DXCH   ERRBTMP

1290                       20,2634  0 0006 1            EXTEND
1291  REF   1             20,2635  3 1532 1            DCA    OMEGAZC
1292  REF  13  LAST  927   20,2636  21'743 1            DAS    ERRBTMP

1293  REF   6  LAST  921   20,2637  30 746 1            CAE    COSCDUZ       PREPARE BODY-AXIS YAW-RATE, OMEGAZB
1294                       20,2640  0 0006 1            EXTEND
1295  REF   6  LAST  921   20,2641  7 0742 1            MP     SINCDUX
1296                       20,2642  20 001 1            DDOUBL
1297                       20,2643  0 0006 1            EXTEND
1298  REF   4  LAST  921   20,2644  7 1657 C            MP     MCDUYDOT
1299                       20,2645  20 001 1            DDOUBL
1300  REF   1             20,2646  53'540 C            DXCH   OMEGAZB

1301  REF   4  LAST  921   20,2647  4 1660 1            CS     MCDUZDOT
1302                       20,2650  0 0006 1            EXTEND
1303  REF   6  LAST  921   20,2651  7 0750 1            MP     COSCDUX
1304                       20,2652  20 001 1            DDOUBL
1305  REF   2  LAST  927   20,2653  21'540 C            DAS    OMEGAZB       (COMPLETED OMEGAZB, SC.AT 1/2TVCDT REVS)

1306                       20,2654  0 0006 1            EXTEND                PICK UP -OMEGAZB (SIGN CHNG, INTEGRATE)
1307  REF   3  LAST  927   20,2655  4 1540 C            DCS    OMEGAZB
1308  REF  14  LAST  927   20,2656  21'743 1            DAS    ERRBTMP

1309  REF   2  LAST  922   20,2657  0 3112 C  YERORLIM TCR    ERRORLIM      YAW   BODY-AXIS-ERROR  INPUT LIMITER

1310  REF  68  LAST  923   20,2660  31'466 1  Y1FILJMP CAE    DAPDATR1      CHECK FOR LEM-ON/-OFF
1311  REF  48  LAST  923   20,2661  7 4675 C            MASK   BIT14         (BIT 14 INDICATES LEM IS ON)
```

```
1312  REF 201  LAST  923    20,2662  10 000 C            CCS     A
1313                        20,2663   1 2666 1            TCF     +3              USE LEM-ON FILTER
1314  REF  52  LAST  923    20,2664   0 4574 C            TC      POSTJUMP        USE LEM-OFF (GEN3DAP) FILTER
1315  REF   1                20,2665    36407 1            CADR    NYONCODE

1316                        20,2666   0 0006 1  YFORWARD  EXTEND                  LEM-ON FILTER COMPUTATIONS
1317  REF   3  LAST  103    20,2667   4 1570 C            DCS     YDSUM           DENOMINATOR TERMS, SC.AT B+0 SPASCREVS
1318  REF   1                20,2670  53'745 1            DXCH    YZERO

1319  REF  15  LAST  927    20,2671  31'742 1            CAE     ERRBTMP         INPUT ERROR,  SC.AT B-1 REVS
1320  REF   3  LAST  103    20,2672   6 1565 C            AD      YNSUM           NUMERATOR TERMS, SC.AT B-1 REVS
1321                        20,2673   0 0006 1            EXTEND
1322  REF   1                20,2674   7 4727 C            MP      KYDN            KYDN, SC.AT B+1 SPASCREV
1323  REF   2  LAST  928    20,2675  21'745 1            DAS     YZERO
1324  REF   4  LAST  928    20,2676  31'566 C            CAE     YNSUM +1
1325                        20,2677   0 0006 1            EXTEND
1326  REF   2  LAST  928    20,2700   7 4727 C            MP      KYDN
1327  REF   3  LAST  928    20,2701  27'745 1            ADS     YZERO +1
1328  REF  65  LAST  924    20,2702  54 001 1            TS      L
1329                        20,2703   1 2705 C            TCF     +2
1330  REF   4  LAST  928    20,2704  27'744 C            ADS     YZERO           (SC.AT B+0 SPASCREV), (YZERO = CMDTMP)

1331                        20,2705   0 0006 1  YZSTORE   EXTEND                  PREPARE YZERO FOR DENOMINATOR LADDER
1332  REF   5  LAST  928    20,2706   3 1745 C            DCA     YZERO               SC.AT B+0 SPASCREV
1333                        20,2707  20 001 1            DDOUBL
1334                        20,2710  20 001 1            DDOUBL
1335                        20,2711  20 001 1            DDOUBL
1336  REF   1                20,2712  53'727 C            DXCH    Y1TMP               SC.AT B-3 SPASCREV

1337  REF   2  LAST  922    20,2713   0 3125 1  OPTVARKY  TCR     OPTVARK         YAW   VARIABLE-GAIN PACKAGE

1338                        20,2714   0 0006 1  YOFFSET   EXTEND                  SIGN CHANGE IN FORWARD LOOP
1339  REF  14  LAST  925    20,2715   4 1745 1            DCS     CMDTMP              (GEN3DAP RETURNS AT YOFFSET)
1340  REF  15  LAST  928    20,2716  53'745 1            DXCH    CMDTMP
1341                        20,2717   0 0006 1            EXTEND                  ADD IN DOUBLE-PRECISION CG OFFSETS
1342  REF   5  LAST  905    20,2720   3 1630 C            DCA     YDELCFF
1343  REF  16  LAST  928    20,2721  21'745 1            DAS     CMDTMP

1344  REF  17  LAST  928    20,2722  31'745 C  YROUND    CAE     CMDTMP +1       ROUND UP FOR OUTPUT
1345                        20,2723   6 0000 1            DOUBLE
1346  REF  66  LAST  928    20,2724  54 001 1            TS      L
1347  REF 161  LAST  923    20,2725   3 4714 1            CAF     ZERO
1348  REF  18  LAST  928    20,2726   6 1744 1            AD      CMDTMP

1349  REF   2  LAST  923    20,2727   0 3145 1  YACLIM    TCR     ACTLIM          YAW   ACTUATOR-COMMAND-LIMITER

1350  REF   4  LAST  916    20,2730   4 1632 C  YOUT      CS      YCMD            INCREMENTAL YAW   COMMAND
1351  REF  19  LAST  928    20,2731   6 1744 1            AD      CMDTMP
1352  REF   3  LAST  916    20,2732  26 053 C            ADS     TVCYAW          UPDATE THE ERROR COUNTER (NO RESTART-
A1353                                                                               PROTECT, SINCE ERROR CNTR ZEROED)
```

```
1354  REF  27  LAST  775   20,2733  3 4677 C            CAF     BIT12      BIT FOR TVCYAW COUNT RELEASE
1355                       20,2734  0 0006 1            EXTEND
1356  REF  10  LAST  923   20,2735  05 014 1            WOR     CHAN14
1357  REF  69  LAST  927   20,2736  31'466 1  Y2FILJMP  CAE     DAPDATR1   CHECK FOR LEM-ON/-OFF
1358  REF  49  LAST  927   20,2737  7 4675 C            MASK    BIT14      (BIT 14 INDICATES LEM IS ON)
1359  REF 2C2  LAST  928   20,2740  10 000 C            CCS     A
1360                       20,2741  1 2744 C            TCF     +3         USE LEM-ON FILTER
1361  REF  53  LAST  928   20,2742  0 4574 C            TC      POSTJUMP   USE LEM-OFF (GEN3DAP) FILTER
1362  REF   1              20,2743   36442 C            CADR    NY1NCDE


1363  REF  16  LAST  928   20,2744  31'742 1  CZSTORE   CAE     ERRBTMP    PREPARE CZERO  (UPPER WORD OF ERRBTMP)
1364                       20,2745  6 0000 1            DOUBLE                 FOR NUMERATOR LADDER....SC.AT B-1
1365  REF   1              20,2746  55'717 C            TS      C1TMP          SC.AT B-2 REVS FOR LADDER


1366                       20,2747  0 0006 1  YNLADDER  EXTEND             PREPARE TEMPORARIES, FOR UPDATING YAW
1367  REF   2  LAST  101   20,2750  3 1572 C            DCA     C1             NUMERATOR LADDER
1368  REF   1              20,2751  53'721 C            DXCH    C2TMP
1369                       20,2752  0 0006 1            EXTEND
1370  REF   2  LAST  101   20,2753  3 1574 C            DCA     C3
1371  REF   1              20,2754  53'723 1            DXCH    C4TMP
1372                       20,2755  0 0006 1            EXTEND
1373  REF   2  LAST  101   20,2756  3 1576 1            DCA     C5
1374  REF   1              20,2757  53'725 1            DXCH    C6TMP

1375  REF   2  LAST  923   20,2760  0 3157 1  YNSUMC    TCR     NSUM       YAW   NUMERATOR SUM


1376                       20,2761  0 0006 1  YDLADDER  EXTEND             PREPARE TEMPORARIES, FOR UPDATING YAW
1377  REF   2  LAST  101   20,2762  3 1600 C            DCA     Y1             DENOMINATOR LADDER
1378  REF   1              20,2763  53'731 1            DXCH    Y2TMP
1379                       20,2764  0 0006 1            EXTEND
1380  REF   2  LAST  101   20,2765  3 1602 1            DCA     Y2
1381  REF   1              20,2766  53'733 C            DXCH    Y3TMP
1382                       20,2767  0 0006 1            EXTEND
1383  REF   2  LAST  101   20,2770  3 1604 1            DCA     Y3
1384  REF   1              20,2771  53'735 C            DXCH    Y4TMP
1385                       20,2772  0 0006 1            EXTEND
1386  REF   3  LAST  103   20,2773  3 1606 C            DCA     Y4
1387  REF   2  LAST  103   20,2774  53'737 1            DXCH    Y5TMP
1388                       20,2775  0 0006 1            EXTEND
1389  REF   3  LAST  103   20,2776  3 1610 1            DCA     Y5
1390  REF   1              20,2777  53'741 C            DXCH    Y6TMP

1391  REF   2  LAST  924   20,3000  0 3217 0  YDSUMC    TCR     DSUM       YAW   DENOMINATOR SUM

1392  REF  20  LAST  928   20,3001  31'744 1  DELBARY   CAE     CMDTMP     UPDATE YAW   OFFSET-TRACKER-FILTER
1393                       20,3002  0 0006 1            EXTEND                 (GEN3DAP RETURNS AT  ..DELBARY..  )
1394  REF   2  LAST  924   20,3003  7 3404 C            MP      1-E(-AT)
```

```
1395  REF   7  LAST  926   20,3004  53'716 1          DXCH   DELBRTMP
1396  REF   5  LAST  905   20,3005  31'623 1          CAE    DELYBAR
1397                       20,3006  0 0006 1          EXTEND
1398  REF   3  LAST  924   20,3007  7 3405 1          MP     E(-AT)
1399  REF   8  LAST  930   20,3010  21'716 1          DAS    DELBRTMP
1400  REF   6  LAST  930   20,3011  31'624 C          CAE    DELYBAR +1
1401                       20,3012  0 0006 1          EXTEND
1402  REF   4  LAST  930   20,3013  7 3405 1          MP     E(-AT)
1403  REF   9  LAST  930   20,3014  27'716 1          ADS    DELBRTMP +1
1404  REF  87  LAST  928   20,3015  54 001 1          TS     L
1405                       20,3016  1 3020 1          TCF    +2
1406  REF  10  LAST  930   20,3017  27'715 1          ADS    DELBRTMP

1407  REF   2  LAST  917   20,3020  0 3022 1 YCOPYCYC TCR    YCOPY          YAW   COPYCYCLE

1408  REF  32  LAST  924   20,3021  1 5222 1 YDAPEND  TCF    RESUME         YAW   DAP COMPLETED
```

P1409 YAW TVCDAP COPYCYCLE SUBROUTINE (CALLED VIA YAW TVCDAP OR TVC RESTART PACKAGE)

```
 1411  REF  10  LAST  926   20,3022  25'654 1  YCOPY   INCR    TVCPHASE      RESTART-PROTECT THE COPYCYCLE.
A1412                                                                          NOTE POSSIBLE RE-ENTRY FROM RESTART
A1413                                                                          PACKAGE, SHOULD A RESTART OCCUR
A1414                                                                          DURING YAW  COPYCYCLE.

 1415                        20,3023  0 0006 1  NEWC(S)  EXTEND                UPDATE YAW  NUMERATOR LADDER FROM
 1416  REF   2  LAST  929   20,3024  3 1720 C            DCA     C1TMP            TEMPORARIES
 1417  REF   3  LAST  929   20,3025  53'572 1            DXCH    C1
 1418                        20,3026  0 0006 1            EXTEND
 1419  REF   1              20,3027  3 1722 1            DCA     C3TMP
 1420  REF   3  LAST  929   20,3030  53'574 1            DXCH    C3
 1421                        20,3031  0 0006 1            EXTEND
 1422  REF   1              20,3032  3 1724 1            DCA     C5TMP
 1423  REF   3  LAST  929   20,3033  53'576 C            DXCH    C5

 1424                        20,3034  0 0006 1  NEWY(S)  EXTEND                UPDATE YAW  DENOMINATOR LADDER FROM
 1425  REF   2  LAST  928   20,3035  3 1727 1            DCA     Y1TMP            TEMPORARIES
 1426  REF   3  LAST  929   20,3036  53'6C0 1            DXCH    Y1
 1427                        20,3037  0 0006 1            EXTEND
 1428  REF   2  LAST  929   20,3040  3 1731 C            DCA     Y2TMP
 1429  REF   3  LAST  929   20,3041  53'6C2 C            DXCH    Y2
 1430                        20,3042  0 0006 1            EXTEND
 1431  REF   2  LAST  929   20,3043  3 1733 1            DCA     Y3TMP
 1432  REF   3  LAST  929   20,3044  53'6C4 C            DXCH    Y3
 1433                        20,3045  0 0006 1            EXTEND
 1434  REF   2  LAST  929   20,3046  3 1735 1            DCA     Y4TMP
 1435  REF   4  LAST  929   20,3047  53'6C6 1            DXCH    Y4
 1436                        20,3050  0 0006 1            EXTEND              (ALSO NY1TMP,+1 TO NY1,+1)
 1437  REF   3  LAST  929   20,3051  3 1737 C            DCA     Y5TMP
 1438  REF   4  LAST  929   20,3052  53'610 C            DXCH    Y5

 1439                        20,3053  0 0006 1  YMISC   EXTEND                MISC....YAW-RATE-ERROR INTEGRATOR
 1440  REF  17  LAST  929   20,3054  3 1743 C            DCA     ERRBTMP
 1441  REF   3  LAST  538   20,3055  55'5C0 1            TS      AK2          FOR YAW  NEEDLES, SC.AT B-1 REVS
 1442  REF   3  LAST  927   20,3056  53'620 C            DXCH    YERRB

 1443                        20,3057  0 0006 1            EXTEND              YAW  NUMERATOR SUM
 1444  REF   5  LAST  925   20,3060  3 1712 1            DCA     NSUMTMP          (ALSO NY2TMP,+1 TO NY2,+1)
 1445  REF   5  LAST  928   20,3061  53'566 1            DXCH    YNSUM

 1446                        20,3062  0 0006 1            EXTEND              YAW  DENOMINATOR SUM
 1447  REF   5  LAST  925   20,3063  3 1714 1            DCA     DSUMTMP          (ALSO NY3TMP,+1 TO NY3,+1)
 1448  REF   4  LAST  928   20,3064  53'570 C            DXCH    YDSUM

 1449  REF  21  LAST  929   20,3065  31'744 1            CAE     CMDTMP      YAW  ACTUATOR COMMAND
 1450  REF   5  LAST  928   20,3066  55'632 C            TS      YCMD

 1451                        20,3067  0 0006 1            EXTEND              YAW  OFFSET-TRACKER-FILTER
```

```
1452   REF  11  LAST  930   20,3070  3 1716 C          DCA     DELBRTMP
1453   REF   7  LAST  930   20,3071  53'624 1          DXCH    DELYBAR

1454   REF 162  LAST  928   20,3072  3 4714 1          CAF     ZERO          YAW   COPYCYCLE COMPLETED
1455   REF  11  LAST  931   20,3073  55'654 C          TS      TVCPHASE            RESET TVCPHASE

1456   REF 181  LAST  926   20,3074  0 0002 C          TC      Q
```

```
P1457   SUBROUTINES COMMON TO BOTH PITCH AND YAW DAPS....

R1458   INITIALIZATION PACKAGE FOR CDURATES....

 1459   REF  14  LAST  927   20,3075  22 016 C  DAPINIT  LXCH   BANKRUPT      T5 RUPT ENTRY (CALLED BY TVCINT4)

 1460   REF  18  LAST  909   20,3076  3 7716 C            CAF    NEGONE          SET UP
 1461   REF   8  LAST  927   20,3077  6 1635 C            AD     T5TVCDT         T5 CALL FOR PITCHDAP IN TVCDT SECS
 1462   REF   3  LAST  427   20,3100  6 4674 C            AD     NEGMAX          (T5TVCDT = POSMAX - TVCDT/2 +1)
 1463   REF   9  LAST  933   20,3101  6 1635 C            AD     T5TVCDT
 1464   REF  14  LAST  927   20,3102  54 030 C            TS     TIME5
 1465   REF   2  LAST  927   20,3103  3 3401 1            CAF    PITCHT5         (BBCON ALREADY THERE)
 1466   REF  18  LAST  927   20,3104  55'312 1            TS     T5LOC

 1467   REF  10  LAST  921   20,3105  30 033 1            CAE    CDUY        READ AND STORE CDUS FOR DIFFERENTIATOR
 1468   REF   4  LAST  921   20,3106  55'655 1            TS     PCDUYPST        PAST-VALUES
 1469   REF  13  LAST  921   20,3107  30 034 C            CAE    CDUZ
 1470   REF   4  LAST  921   20,3110  55'656 1            TS     PCDUZPST

 1471   REF   3  LAST  915   20,3111  1 5224 1            TCF    NOQRSM

R1472   BODY-AXIS-ERROR  INPUT LIMITER PACKAGE....

 1473   REF  18  LAST  931   20,3112  31'742 1  ERRORLIM  CAE    ERRBTMP     CHECK FOR INPUT-ERROR LIMIT
 1474                        20,3113  0 0006 1            EXTEND                  CHECKS UPPER WORD ONLY
 1475   REF   1              20,3114  7 4710 1            MP     1/ERRLIM
 1476                        20,3115  0 0006 1            EXTEND
 1477                        20,3116  1 3124 1            BZF    +6
 1478   REF  19  LAST  933   20,3117  11'742 C            CCS    ERRBTMP
 1479   REF   1              20,3120  3 4676 1            CAF    ERRLIM
 1480                        20,3121  1 3123 C            TCF    +2
 1481   REF   2  LAST  933   20,3122  4 4676 C            CS     ERRLIM
 1482   REF  20  LAST  933   20,3123  55'742 C            TS     ERRBTMP     LIMIT WRITES OVER UPPER WORD ONLY

 1483   REF 182  LAST  932   20,3124  0 0002 C            TC     Q


R1484   VARIABLE-GAIN PACKAGE....

 1485   REF  22  LAST  931   20,3125  31'744 1  OPTVARK   CAE    CMDTMP      VARIABLE-GAIN PACKAGE....CMDTMP CONTAINS
 1486                        20,3126  0 0006 1            EXTEND                  JZERO OR YZERO
 1487   REF   4  LAST  907   20,3127  7 1651 C            MP     VARK        VARIABLE-GAIN, SC.AT 4 ASCREV/SPASCREV
 1488   REF  23  LAST  933   20,3130  53'745 1            DXCH   CMDTMP
 1489   REF 203  LAST  929   20,3131  22 000 1            LXCH   A           LO-ORDER WORD OF INPUT CMDTMP
 1490                        20,3132  0 0006 1            EXTEND
 1491   REF   5  LAST  933   20,3133  7 1651 C            MP     VARK
 1492   REF  24  LAST  933   20,3134  27'745 1            ADS    CMDTMP +1
 1493   REF  88  LAST  930   20,3135  54 001 1            TS     L
```

```
1494                          20,3136  1 3140 C          TCF     +2
1495   REF  25 LAST  933      20,3137  27'744 C          ADS     CMDTMP

1496   REF  26 LAST  934      20,3140  53'745 1          DXCH    CMDTMP          FIX UP SCALING
1497                          20,3141  20 001 1          DDOUBL
1498                          20,3142  20 001 1          DDOUBL
1499   REF  27 LAST  934      20,3143  53'745 1          DXCH    CMDTMP

1500   REF 183 LAST  933      20,3144  0 0002 C          TC      Q


R1501  ACTUATOR-COMMAND LIMITER PACKAGE....

1502                          20,3145  0 0006 1 ACTLIM   EXTEND                  CHECK FOR ACTUATOR COMMAND LIMIT
1503   REF   1                20,3146  7 3400 1          MP      1/ACTSAT
1504                          20,3147  0 0006 1          EXTEND
1505                          20,3150  1 3156 1          BZF     +6
1506   REF  28 LAST  934      20,3151  11'744 C          CCS     CMDTMP          APPLY LIMITS
1507   REF   1                20,3152  3 3377 1          CAF     ACTSAT
1508                          20,3153  1 3155 1          TCF     +2
1509   REF   2 LAST  934      20,3154  4 3377 C          CS      ACTSAT
1510   REF  29 LAST  934      20,3155  55'744 C          TS      CMDTMP          LIMITS WRITE OVER CMDTMP

1511   REF 184 LAST  934      20,3156  0 0002 C          TC      Q


R1512  NUMERATOR-SUM COMPUTATION....

1513   REF   5 LAST  925      20,3157  31'717 1 NSUM     CAE     B1TMP           PREPARE NUMERATOR SUM, SCALING IS AT
1514                          20,3160  0 0006 1          EXTEND                          B+0 REVS  ( = B+2 X B-2 )
1515   REF   1                20,3161  7 3406 1          MP      N1
1516   REF   6 LAST  931      20,3162  53'712 C          DXCH    NSUMTMP

1517   REF   4 LAST  923      20,3163  31'720 C          CAE     B2TMP
1518                          20,3164  0 0006 1          EXTEND
1519   REF   1                20,3165  7 3407 C          MP      N2
1520   REF   7 LAST  934      20,3166  21'712 C          DAS     NSUMTMP

1521   REF   4 LAST  925      20,3167  31'721 1          CAE     B3TMP
1522                          20,3170  0 0006 1          EXTEND
1523   REF   1                20,3171  7 3410 C          MP      N3
1524   REF   8 LAST  934      20,3172  21'712 C          DAS     NSUMTMP

1525   REF   4 LAST  923      20,3173  31'722 1          CAE     B4TMP
1526                          20,3174  0 0006 1          EXTEND
1527   REF   1                20,3175  7 3411 1          MP      N4
1528   REF   9 LAST  934      20,3176  21'712 C          DAS     NSUMTMP

1529   REF   4 LAST  925      20,3177  31'723 C          CAE     B5TMP
1530                          20,3200  0 0006 1          EXTEND
```

```
1531  REF   1              20,3201  7 3412 1          MP      N5
1532  REF  10  LAST  934   20,3202  21'712 C          DAS     NSUMTMP

1533  REF   4  LAST  923   20,3203  31'724 1          CAE     B6TMP
1534                        20,3204  0 0006 1          EXTEND
1535  REF   1              20,3205  7 3413 C          MP      N6
1536  REF  11  LAST  935   20,3206  21'712 C          DAS     NSUMTMP

1537  REF   3  LAST  104   20,3207  31'725 C          CAE     B7TMP
1538                        20,3210  0 0006 1          EXTEND
1539  REF   1              20,3211  7 3414 1          MP      N7
1540  REF  12  LAST  935   20,3212  21'712 C          DAS     NSUMTMP

1541  REF  13  LAST  935   20,3213  53'712 C  NSUMSC   DXCH    NSUMTMP       FIX UP SCALING (NOW AT B+0 REVS)
1542                        20,3214  20 001 1          DDOUBL
1543  REF  14  LAST  935   20,3215  53'712 C          DXCH    NSUMTMP       SC.AT B-1 REV

1544  REF 185  LAST  934   20,3216  0 0002 C          TC      Q

R1545  DENOMINATOR-SUM COMPUTATION....

1546  REF   5  LAST  925   20,3217  31'726 C  DSUM     CAE     J1TMP         PREPARE DENOMINATOR SUM, SCALED
1547                        20,3220  0 0006 1          EXTEND                      AT B+1 SPASCREVS ( = B+4 X B-3 )
1548  REF   1              20,3221  7 3415 C          MP      D1            (J1TMP = J,YZERO,  SC.AT  B-3 REVS)
1549  REF   6  LAST  931   20,3222  53'714 C          DXCH    DSUMTMP
1550  REF   6  LAST  935   20,3223  31'726 C          CAE     J1TMP
1551                        20,3224  0 0006 1          EXTEND
1552  REF   2  LAST  935   20,3225  7 3416 C          MP      D1 +1
1553  REF   7  LAST  935   20,3226  27'714 C          ADS     DSUMTMP +1
1554  REF  89  LAST  933   20,3227  54 001 1          TS      L
1555                        20,3230  1 3232 C          TCF     +2
1556  REF   8  LAST  935   20,3231  27'713 1          ADS     DSUMTMP
1557  REF   7  LAST  935   20,3232  31'727 1          CAE     J1TMP +1
1558                        20,3233  0 0006 1          EXTEND
1559  REF   3  LAST  935   20,3234  7 3415 C          MP      D1
1560  REF   9  LAST  935   20,3235  27'714 C          ADS     DSUMTMP +1
1561  REF  9C  LAST  935   20,3236  54 001 1          TS      L
1562                        20,3237  1 3241 1          TCF     +2
1563  REF  10  LAST  935   20,3240  27'713 1          ADS     DSUMTMP

1564  REF   5  LAST  925   20,3241  31'730 1  D2J2     CAE     J2TMP
1565                        20,3242  0 0006 1          EXTEND
1566  REF   1              20,3243  7 3417 1          MP      D2
1567  REF  11  LAST  935   20,3244  21'714 C          DAS     DSUMTMP
1568  REF   6  LAST  935   20,3245  31'730 1          CAE     J2TMP
1569                        20,3246  0 0006 1          EXTEND
1570  REF   2  LAST  935   20,3247  7 3420 C          MP      D2 +1
1571  REF  12  LAST  935   20,3250  27'714 C          ADS     DSUMTMP +1
1572  REF  91  LAST  935   20,3251  54 001 1          TS      L
```

```
1573                                20,3252  1 3254 C            TCF     +2
1574  REF  13 LAST  935             20,3253  27'713 1            ADS     DSUMTMP
1575  REF   7 LAST  935             20,3254  31'731 C            CAE     J2TMP +1
1576                                20,3255  0 0006 1            EXTEND
1577  REF   3 LAST  935             20,3256  7 3417 1            MP      D2
1578  REF  14 LAST  936             20,3257  27'714 C            ADS     DSUMTMP +1
1579  REF  92 LAST  935             20,3260  54 001 1            TS      L
1580                                20,3261  1 3263 1            TCF     +2
1581  REF  15 LAST  936             20,3262  27'713 1            ADS     DSUMTMP

1582  REF   5 LAST  925             20,3263  31'732 C  D3J3      CAE     J3TMP
1583                                20,3264  0 0006 1            EXTEND
1584  REF   1                       20,3265  7 3421 1            MP      D3
1585  REF  16 LAST  936             20,3266  21'714 C            DAS     DSUMTMP
1586  REF   6 LAST  936             20,3267  31'732 C            CAE     J3TMP
1587                                20,3270  0 0006 1            EXTEND
1588  REF   2 LAST  936             20,3271  7 3422 1            MP      D3 +1
1589  REF  17 LAST  936             20,3272  27'714 C            ADS     DSUMTMP +1
1590  REF  93 LAST  936             20,3273  54 001 1            TS      L
1591                                20,3274  1 3276 C            TCF     +2
1592  REF  18 LAST  936             20,3275  27'713 1            ADS     DSUMTMP
1593  REF   7 LAST  936             20,3276  31'733 1            CAE     J3TMP +1
1594                                20,3277  0 0006 1            EXTEND
1595  REF   3 LAST  936             20,3300  7 3421 1            MP      D3
1596  REF  19 LAST  936             20,3301  27'714 C            ADS     DSUMTMP +1
1597  REF  94 LAST  936             20,3302  54 001 1            TS      L
1598                                20,3303  1 3305 C            TCF     +2
1599  REF  20 LAST  936             20,3304  27'713 1            ADS     DSUMTMP

1600  REF   5 LAST  925             20,3305  31'734 C  D4J4      CAE     J4TMP
1601                                20,3306  0 0006 1            EXTEND
1602  REF   1                       20,3307  7 3423 0            MP      D4
1603  REF  21 LAST  936             20,3310  21'714 C            DAS     DSUMTMP
1604  REF   6 LAST  936             20,3311  31'734 C            CAE     J4TMP
1605                                20,3312  0 0006 1            EXTEND
1606  REF   2 LAST  936             20,3313  7 3424 1            MP      D4 +1
1607  REF  22 LAST  936             20,3314  27'714 C            ADS     DSUMTMP +1
1608  REF  95 LAST  936             20,3315  54 001 1            TS      L
1609                                20,3316  1 3320 1            TCF     +2
1610  REF  23 LAST  936             20,3317  27'713 1            ADS     DSUMTMP
1611  REF   7 LAST  936             20,3320  31'735 1            CAE     J4TMP +1
1612                                20,3321  0 0006 1            EXTEND
1613  REF   3 LAST  936             20,3322  7 3423 C            MP      D4
1614  REF  24 LAST  936             20,3323  27'714 C            ADS     DSUMTMP +1
1615  REF  96 LAST  936             20,3324  54 001 1            TS      L
1616                                20,3325  1 3327 C            TCF     +2
1617  REF  25 LAST  936             20,3326  27'713 1            ADS     DSUMTMP

1618  REF   6 LAST  925             20,3327  31'736 1  D5J5      CAE     J5TMP
1619                                20,3330  0 0006 1            EXTEND
```

```
1620  REF   1                20,3331  7 3425 C          MP      D5
1621  REF  26  LAST  936     20,3332  21'714 C          DAS     DSUMTMP
1622  REF   7  LAST  936     20,3333  31'736 1          CAE     J5TMP
1623                          20,3334  0 0006 1          EXTEND
1624  REF   2  LAST  937     20,3335  7 3426 C          MP      D5 +1
1625  REF  27  LAST  937     20,3336  27'714 C          ADS     DSUMTMP +1
1626  REF  97  LAST  936     20,3337  54 001 1          TS      L
1627                          20,3340  1 3342 C          TCF     +2
1628  REF  28  LAST  937     20,3341  27'713 1          ADS     DSUMTMP
1629  REF   8  LAST  937     20,3342  31'737 C          CAE     J5TMP +1
1630                          20,3343  0 0006 1          EXTEND
1631  REF   3  LAST  937     20,3344  7 3425 C          MP      D5
1632  REF  29  LAST  937     20,3345  27'714 C          ADS     DSUMTMP +1
1633  REF  98  LAST  937     20,3346  54 001 1          TS      L
1634                          20,3347  1 3351 1          TCF     +2
1635  REF  30  LAST  937     20,3350  27'713 1          ADS     DSUMTMP

1636  REF   4  LAST  924     20,3351  31'740 C  D6J6    CAE     J6TMP
1637                          20,3352  0 0006 1          EXTEND
1638  REF   1                20,3353  7 3427 1          MP      D6
1639  REF  31  LAST  937     20,3354  21'714 C          DAS     DSUMTMP
1640  REF   5  LAST  937     20,3355  31'740 C          CAE     J6TMP
1641                          20,3356  0 0006 1          EXTEND
1642  REF   2  LAST  937     20,3357  7 3430 1          MP      D6 +1
1643  REF  32  LAST  937     20,3360  27'714 C          ADS     DSUMTMP +1
1644  REF  99  LAST  937     20,3361  54 001 1          TS      L
1645                          20,3362  1 3364 1          TCF     +2
1646  REF  33  LAST  937     20,3363  27'713 1          ADS     DSUMTMP
1647  REF   6  LAST  937     20,3364  31'741 1          CAE     J6TMP +1
1648                          20,3365  0 0006 1          EXTEND
1649  REF   3  LAST  937     20,3366  7 3427 1          MP      D6
1650  REF  34  LAST  937     20,3367  27'714 C          ADS     DSUMTMP +1
1651  REF 100  LAST  937     20,3370  54 001 1          TS      L
1652                          20,3371  1 3373 1          TCF     +2
1653  REF  35  LAST  937     20,3372  27'713 1          ADS     DSUMTMP

1654  REF  36  LAST  937     20,3373  53'714 C  DSUMSC   DXCH    DSUMTMP         FIX UP SCALING  (NOW AT B+1 SPASCREV)
1655                          20,3374  20 001 1          DDOUBL
1656  REF  37  LAST  937     20,3375  53'714 C          DXCH    DSUMTMP         SC.AT  B+0 SPASCREV

1657  REF 186  LAST  935     20,3376  0 0002 C          TC      Q
```

L TVCEAPS USER'S PAGE NO. 21 E6 S3

P1658 CONSTANTS FOR AUTOPILOTS

R1659 NOTE....1 ASCREV (ACTUATOR CMD SCALING) = 85.41 ARCSEC/BIT OR 1.07975111 REVS (85.41X16384/3600/360)

R1661 1 SPASCREV (SPECIAL ACTUATOR CMD SCALING) = 1.04620942 REVS

```
1663                    20,3377  00375 0  ACTSAT   DEC     253              ACTUATOR LIMIT (6 DEG),  SC.AT 1ASCREV
1664                    20,3400  00101 1  1/ACTSAT DEC     .0039525692      RECIPROCAL (1/253)

1665  REF  38 LAST 910    4676            ERRLIM   EQUALS  BIT13            FILTER INPUT LIMIT....B-3 REVS (45DEG),
1666  REF  27 LAST 898    4710            1/ERRLIM EQUALS  BIT3                SC.AT B-1 REV, AND ITS RECIPROCAL

1667  REF   1             4727            KPDN     =       DEC45            DESIGN-NOMINAL FILTER GAIN, SC.AT B+1
1668  REF   3 LAST 922    4727            KYDN     =       KPDN                  SPASCREV (FOR DEC45 BITS EXACTLY)
A1669                                                                              KPDN = .005747 DEG/DEG
A1670                                                                              SCALED KPDN = DEC45
A1671                                                                              1SPASCREV = KPDN(B+14)/(2X45)
A1672                                                                                        = 1.04620942 REVS

1673  REF   1             20,3401  02326 1  PITCHT5  GENADR  PITCHDAP        UPPER WORDS OF T5 2CADRS, LOWER WORDS
1674  REF   2 LAST 899    20,3402  03075 0  DAPT5    GENADR  DAPINIT             (BBCON) ALREADY THERE.  ORDER IS
1675  REF   1             20,3403  02616 1  YAWT5    GENADR  YAWDAP              REQUIRED.

1676                    20,3404  00243 1  1-E(-AT) OCT     00243            AT = .01SEC....EITHER(1/A=4SEC, T=40MS),
1677                    20,3405  37535 0  E(-AT)   OCT     37535                                 OR(1/A=8SEC, T=80MS)

1678                    20,3406  50166 0  N1       DEC    -2.9708385  B-2 NUMERATOR COEFS (CSM/LEM), SC.AT B+2

1679                    20,3407  31436 1  N2       DEC     3.1947342  B-2

1680                    20,3410  74561 0  N3       DEC    -0.40962906 B-2

1681                    20,3411  53277 0  N4       DEC    -2.5780275  B-2

1682                    20,3412  27550 1  N5       DEC     2.9629319  B-2

1683                    20,3413  63725 1  N6       DEC    -1.5101470  B-2

1684                    20,3414  02400 1  N7       DEC     0.31243224 B-2

1685                    20,3415  66341 1  D1       2DEC   -4.7798977  B-4 DENOMINATOR COEFS (CSM/LEM), SC.AT B+4
1685                    20,3416  54237 0

1686                    20,3417  22707 1  D2       2DEC    9.4452763  B-4
1686                    20,3420  36641 1
```

```
1687                20,3421   54220 0  D3      2DEC   -9.8593475  B-4
1687                20,3422   40714 1
1688                20,3423   13344 0  D4      2DEC    5.7231811  B-4
1688                20,3424   21146 1
1689                20,3425   74401 1  D5      2DEC   -1.7484750  B-4
1689                20,3426   61760 1
1690                20,3427   00340 0  D6      2DEC    0.21933335 B-4
1690                20,3430   23073 1
```

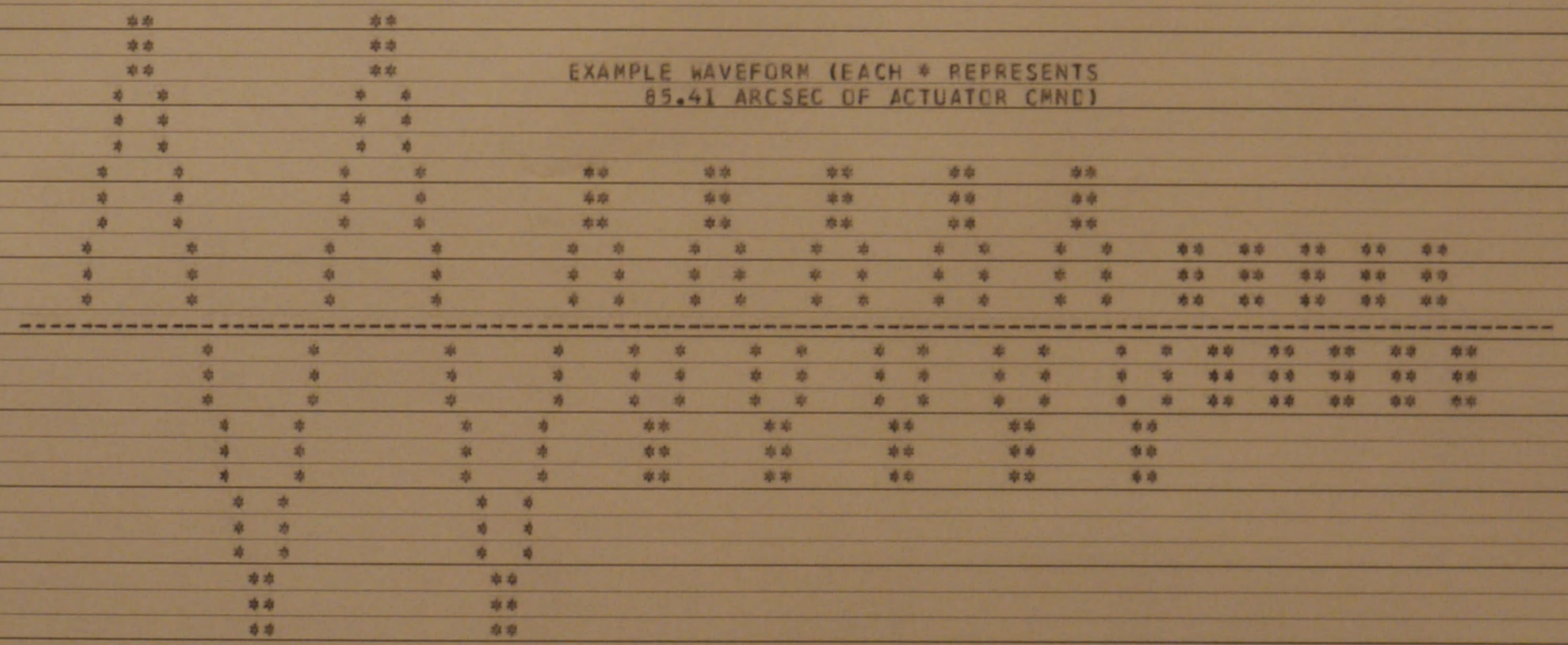
```
R1000   NAME      STROKE TEST PACKAGE   (INCLUDING INITIALIZATION PACKAGE)
R1001   ORIGINAL CODING BY OLSSON        LOG SECTION....STROKE TEST PACKAGE
R1002   MOD BY ENGEL                     DATE....21 MARCH, 1967

R1003   FUNCTIONAL DESCRIPTION....
R1004        STROKE TEST PACKAGE GENERATES A WAVEFORM DESIGNED TO EXCITE BENDING
R1005        STRKTSTI (STROKE TEST INITIALIZATION) IS CALLED AS A JOB BY V68.
R1006                 IT INITIALIZES ALL ERASABLES REQD FOR A STROKE TEST, AND
R1007                 THEN TESTS FOR AN RCS DAP. IF RCS IT SETS STROKER = ESTROKER
R1009                 FOR AN IMMEDIATE STROKE TEST, OTHERWISE IT MERELY ENABLES
R1010                 A STROKE TEST BY SETTING STROKER TO -0. THE STROKE TEST
R1011                 THEN AWAITS SWITCHOVER TO THE RCS DAP WHEREUPON IT IS
R1012                 ENABLED AFTER AN ADDITIONAL 4 SECOND DELAY TO AVOID
R1013                 THE SWITCHOVER TRANSIENTS (SEE STRKCALL, STRKUP IN
R1014                 TVCEXECUTIVE)
R1015        HACK (STROKE TEST) GENERATES THE WAVEFORM BY DUMPING PULSE BURSTS
R1016                 OF PROPER SIGN AND IN PROPER SEQUENCE DIRECTLY INTO
R1017                 TVCPITCH, WORKING IN CONJUNCTION WITH BOTH PITCH AND YAW
R1018                 TVC DAPS, WITH INTERMEDIATE WAITLIST CALLS. NOTE, HOWEVER
R1019                 THAT THE STROKE TEST IS PERFORMED ONLY IN THE PITCH AXIS.
R1020                 AN EXAMPLE WAVEFORM IS GIVEN BELOW, TO DEMONSTRATE STROKE-
R1021                 TEST PARAMETER SELECTION
R1022        RESTARTS CAUSE TEST TO BE TERMINATED. ANOTHER V68 REQD IF TEST
R1023                 IS TO BE RE-RUN.
R1027        PULSE BURST SIZE IS PAD-LOADED (ESTROKER) SO THAT AMPLITUDE OF
R1028                 WAVEFORM CAN BE CHANGED.  THERE ARE TEN PULSE BURSTS IN
R1029                 THE HALF-AMPLITUDE OF THE FIRST FREQUENCY SET IN THE
R1030                 STANDARD WAVEFORM.  AMPLITUDE IS 10(ESTROKER)(1/42.15),
R1031                 NOMINALLY 50/42.15  =  1.185 DEG
R1032   CALLING SEQUENCE....
R1033        EXTENDED VERB 68 SETS UP STRKTSTI JOB
R1034        PITCH AND YAW TVCDAPS, FINDING STROKER NON-ZERO, DO A  ..TC HACK..
R1035        AN INTERNALLY-GENERATED WAITLIST CALL ENTERS AT  ..HACKWLST..
R1036   NORMAL EXIT MODES....
R1037        TC BANKER  (..Q.. IF ENTRY FROM DAP, ..TCTSKOVR.. IF FROM WAITLIST)LIST
R1039   SUBROUTINES CALLED....
R1040        WAITLIST
R1041   ALARM OR ABORT EXIT MODES....
R1042        NONE
R1043   ERASABLE INITIALIZATION REQUIRED....
R1044        ESTROKER (PAD-LOAD)
R1045        STROKER,  CADDY,  REVS,  CARD,  N
R1046   OUTPUT....
R1047        STRKTSTI...INITIALIZATION FOR STROKE TEST
R1048        HACK, HACKWLST...PULSE BURSTS INTO TVCPITCH VIA..ADS..
R1049                          RESETS STROKER = +0 WHEN TEST COMPLETED
R1050   DEBRIS....
R1051        N = CADDY = +0,  CARD = -0,  REVS = -1
R1052        BANKER
R1053
```

L TVCSTROKETEST USER'S PAGE NO. 2 EO S3

P1054 EXAMPLE STROKE TEST WAVE FORM, DEMONSTRATING PARAMETER SELECTION

R1055 NOTE....THIS IS NOT THE OFFICIAL WAVEFORM....



R1105 FOR THIS (UNOFFICIAL, EXAMPLE) WAVEFORM, THE REQUIRED PARAMETERS ARE AS FOLLOWS....

R1107 FCARD = +3 (NUMBER OF SETS)
R1108 ESTROKER = +3 (PULSE BURST SIZE, SC.AT 85.41 ARCSEC/BIT)

R1109 SET1..
R1110 FREVS = +3 (NUMBER REVERSALS MINUS 1)
R1111 FCADDY = +4 (NUMBER OF PULSE BURSTS IN 1/2 AMPLITUDE)
R1112 SET2..
R1113 FCARD1 = +9 (NUMBER REVERSALS MINUS 1)
R1114 FCARD4 = +2 (NUMBER OF PULSE BURSTS IN 1/2 AMPLITUDE)
R1115 SET3..
R1116 FCARD2 = +9 (NUMBER REVERSALS MINUS 1)
R1117 FCARD5 = +1 (NUMBER OF PULSE BURSTS IN 1/2 AMPLITUDE)
R1118 SET4..
R1119 FCARD3 = +0 (NUMBER REVERSALS MINUS 1)
R1120 FCARD6 = +0 (NUMBER OF PULSE BURSTS IN 1/2 AMPLITUDE)

P1121 STROKE TEST INITIALIZATION PACKAGE (AS A JOB, FROM VERB 68)

```
1122                          17,2215                  BANK   17
1123  REF   2 LAST  919       20,2000                  SETLOC DAPS2
1124                          20,3431                  BANK

1125  REF   1                                          COUNT* $$/STRK
1126  REF   2 LAST  102       E6,1665                  EBANK= CADDY

1127  REF   1                 20,3431  0 3450 0 STRKTSTI TCR    TSTINIT      STROKE TEST INITIALIZATION PKG (CALLED
A1128                                                                          AS A JOB BY VERB68)

1129                          20,3432  0 0004 0 TVCDTCHK INHINT               STROKE TEST PERMITTED ONLY WITH 80MS DAP
1130  REF  10 LAST  933       20,3433  31'635 0         CAE    T5TVCDT            CHECK CURRENT TIMING
1131  REF 101 LAST  937       20,3434  54 001 1         TS     L
1132  REF   2 LAST  904       20,3435  3 7677 0         CAF    OCT37774           LOOK FOR 80MS (T5)
1133                          20,3436  0 0006 1         EXTEND
1134  REF  10 LAST  183       20,3437  06 001 0         RXOR   LCHAN              +0 IF 80MS
1135  REF 204 LAST  933       20,3440  10 000 0         CCS    A
1136                          20,3441  1 3445 0         TCF    +4                 NOT 80MS

1137  REF   6 LAST  905       20,3442  31'412 1         CAE    ESTROKER           80MS. OK, SET STROKER FOR TEST
1138  REF   9 LAST  927       20,3443  55'614 1         TS     STROKER
1139                          20,3444  1 3447 1         TCF    +3

1140  REF 163 LAST  932       20,3445  4 4714 0         CS     ZERO               ENABLE, BUT DO NOT ACTIVATE STROKE
1141  REF  10 LAST  942       20,3446  55'614 1         TS     STROKER                 TEST, AWAITING SWITCHOVER
A1142                                                                                 TC MODOR (MOD80)
1143  REF 103 LAST  888       20,3447  1 5112 1         TCF    ENDOFJOB

1144  REF   1                 20,3450  4 3460 1 TSTINIT CS     FCADDY       NORMAL ENTRY FROM STRKTSTI
1145  REF   3 LAST  942       20,3451  55'665 1         TS     CADDY
1146  REF   2 LAST  102       20,3452  55'666 1         TS     N                  NOTE SGN CHNG FCADDY(+) TO CADDY(-)

1147  REF   1                 20,3453  3 3461 1         CAF    FREVS
1148  REF   2 LAST  102       20,3454  55'670 0         TS     REVS

1149  REF   1                 20,3455  4 3462 0         CS     FCARD              NOTE SGN CHNG FCARD(+) TO CARD(-)
1150  REF   2 LAST  102       20,3456  55'671 1         TS     CARD

1151  REF 187 LAST  937       20,3457  0 0002 0         TC     Q          RETURN TO STRKTSTI+1  (OR CHKSTRK+2OR+4)
```

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P1152   THE OFFICIAL STROKE TEST WAVEFORM (3 JAN, 1967) CONSISTS OF FOUR STROKE SETS, AS FOLLOWS....

R1154         SET 1...10 BURSTS IN 1/2 AMP,   4 REVERSALS
R1155         SET 2... 6 BURSTS IN 1/2 AMP,   6 REVERSALS
R1156         SET 3... 5 BURSTS IN 1/2 AMP,  10 REVERSALS
R1157         SET 4... 4 BURSTS IN 1/2 AMP,  14 REVERSALS
R1158   THE PULSE BURST SIZE (ESTROKER) IS PAD-LOADED (5 BITS AS OF 3JAN,1967)
R1159   THE REMAINING WAVEFORM-GENERATING PARAMETERS ARE AS FOLLOWS....

 1160                        20,3460   00012 1  FCADDY   DEC     10          NO. PULSE BURSTS IN 1/2 AMP, SET1..(+10)
 1161                        20,3461   00003 1  FREVS    DEC      3          NO. REVERSALS MINUS 1, SET1........(  3)

 1162                        20,3462   00004 0  FCARD    DEC      4          NO. STROKE SETS.....................(+ 4)

 1163                        20,3463   00005 1  FCARD1   DEC      5          NO. REVERSALS MINUS 1, SET2........(  5)

 1164                        20,3464   00011 1  FCARD2   DEC      9                                      3........(  9)
 1165                        20,3465   00015 0  FCARD3   DEC     13                                      4........( 13)

 1166                        20,3466   00006 1  FCARD4   DEC      6          NO. PULSE BURSTS IN 1/2 AMP, SET2..(+ 6)
 1167                        20,3467   00005 1  FCARD5   DEC      5                                   SET3..(+ 5)
 1168                        20,3470   00004 0  FCARD6   DEC      4                                   SET4..(+ 4)

 1169   REF  37 LAST 915      4711             20MS     =      BIT2

R1170   STROKE TEST PACKAGE PROPER....

 1171   REF   2 LAST 102    E6,1667                        EBANK= BUNKER

 1172                       20,3471   0 0006 1  HACK     EXTEND                 ENTRY (IN T5 RUPT) FROM TVCDAPS
 1173   REF   3 LAST 943    20,3472   23*667 1           QXCH    BUNKER         SAVE Q FOR DAP RETURN

 1174   REF   1             20,3473   3 4711 1           CAF     20MS           2DAPSX2(PASSES/DAP)X2(CS/PASS)=8CS=TVCDT
 1175   REF  44 LAST 915    20,3474   0 5140 1           TC      WAITLIST
 1176   REF   4 LAST 943    E6,1667                        EBANK=  BUNKER
 1177   REF   1             20,3475    03500 1           2CADR   HACKWLST
 1177   REF   1             20,3476    40066 0
 1178                       20,3477   1 3502 1           TCF     +3

 1179   REF   1             20,3500   3 4367 1  HACKWLST CAF     TCTSKOVR       ENTRY FROM WAITLIST
 1180   REF   5 LAST 943    20,3501   55*667 0           TS      BUNKER         BUNKER IS TC TASKOVER

 1181   REF  11 LAST 942    20,3502   3 1614 0           CA      STROKER        STROKE
 1182   REF   5 LAST 923    20,3503   26 054 1           ADS     TVCPITCH

 1183   REF  25 LAST 923    20,3504   3 4700 1           CAF     BIT11          RELEASE THE ERROR COUNTERS
 1184                       20,3505   0 0006 1           EXTEND
 1185   REF  11 LAST 925    20,3506   05 014 1           WOR     CHAN14
 1186   REF   4 LAST 942    20,3507   25*665 0           INCR    CADDY          COUNT DOWN THE NO. BURSTS, THIS SLOPE
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1187  REF   5  LAST  943   20,3510  4 1665 1          CS      CADDY
1188                       20,3511  0 0006 1          EXTEND
1189                       20,3512  6 3514 1          BZMF    +2
1190  REF   6  LAST  943   20,3513  0 1667 1          TC      BUNKER      EXIT, WHILE ON A SLOPE

1191  REF   3  LAST  942   20,3514  11'670 0          CCS     REVS
1192  REF   1              20,3515  1 3535 0          TCF     REVUP       POSITIVE REVS
1193  REF   2  LAST  944   20,3516  1 3541 0          TCF     REVUP +4    FINAL REVERSAL, THIS SET

1194  REF   3  LAST  942   20,3517  25'671 0          INCR    CARD        NEGATIVE REVS SET LAST PASS, READY FOR
1195  REF   4  LAST  944   20,3520  4 1671 1          CS      CARD              THE NEXT SET. CHECK IF NO MORE SETS
1196                       20,3521  0 0006 1          EXTEND
1197  REF   1              20,3522  1 3533 0          BZF     STROKILL    ALL SETS COMPLETED

1198  REF   5  LAST  944   20,3523  51'671 0          INDEX   CARD
1199  REF   2  LAST  942   20,3524  3 3466 0          CAF     FCARD +4    PICK UP NO. REVERSALS (-), NEXT SET
1200  REF   4  LAST  944   20,3525  55'670 0          TS      REVS        REINITIALIZE
1201  REF   6  LAST  944   20,3526  51'671 0          INDEX   CARD
1202  REF   3  LAST  944   20,3527  4 3471 1          CS      FCARD +7    PICK UP NO. BURSTS IN 1/2AMP, NEXT SET
1203  REF   3  LAST  942   20,3530  55'666 1          TS      N           REINITIALIZE
1204  REF   6  LAST  944   20,3531  55'665 1          TS      CADDY
1205  REF   7  LAST  944   20,3532  0 1667 1          TC      BUNKER      EXIT, AT END OF SET

1206  REF   12 LAST  943   20,3533  55'614 1  STROKILL TS     STROKER     RESET (TO +0) TO END TEST
1207  REF   8  LAST  944   20,3534  0 1667 1          TC      BUNKER      EXIT, STROKE TEST FINIS

1208  REF   5  LAST  944   20,3535  55'670 0  REVUP   TS      REVS        ALL REVERSALS EXCEPT LAST OF SET
1209  REF   4  LAST  944   20,3536  3 1666 0          CA      N
1210                       20,3537  6 0000 1          DOUBLE              2 X 1/2AMP
1211                       20,3540  1 3544 0          TCF     +4

1212  REF   99 LAST  848   20,3541  4 4712 0    +4    CS      ONE         FINAL REVERSAL, THIS SET
1213  REF   6  LAST  944   20,3542  55'670 0          TS      REVS        PREPARE TO BRANCH TO NEW BURST
1214  REF   5  LAST  944   20,3543  3 1666 0          CA      N           JUST RETURN TO ZERO, FINAL SLOPE OF SET
1215  REF   7  LAST  944   20,3544  55'665 1          TS      CADDY       CADUP

1216  REF   13 LAST  944   20,3545  4 1614 1          CS      STROKER     CHANGE SIGN OF SLOPE
1217  REF   14 LAST  944   20,3546  55'614 1          TS      STROKER
1218  REF   9  LAST  944   20,3547  0 1667 1          TC      BUNKER      EXIT AT A REVERSAL (SLOPE CHANGE)
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L TVCROLLDAP USER'S PAGE NO. 1 EO S3

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R1000   PROGRAM NAME....ROLL AUTOPILOT, CONSISTING OF ROLLDAP,DURATION,NOROLL1,E
R1001   ORIGINAL CODING BY F.W.MARTIN, 1965 (SUNDIAL)                      TC.
R1003   LOC SECTION....ROLL AUTOPILOT   SUBROUTINE....DAPCSM
R1004   MOD BY ENGEL                    DATE 28 DEC, 1967 (SUNDISK TO COLOSSUS)
R1005   FUNCTIONAL DESCRIPTION....

R1006       *AN ADAPTATION OF THE LEM P-AXIS CONTROLLER
R1007       *MAINTAIN OGA WITHIN 5 DEG DEADBND OF OGAD, WHERE OGAD = OGA AS SEEN
R1008        BY IGNOVER  (IGNITION)
R1009       *MAINTAIN OGA RATE LESS THAN 0.1 DEG/SEC LIMIT CYCLE RATE
R1012       *SWITCHING LOGIC IN PHASE PLANE.... SEE GSOP CHAPTER 3
R1013       *USES 16 CLOCK TO TIME JET FIRINGS
R1014       *MAXIMUM JET FIRING TIME = 2.56 SECONDS, LIMITED TO 2.5 IF GREATER
R1015       *MINIMUM JET FIRING TIME = 15 MS
R1016       *JET PAIRS FIRE ALTERNATELY
R1017       *AT LEAST 1/2 SECOND DELAY BEFORE A NEW JET PAIR IS FIRED
R1018       *JET FIRINGS MAY NOT BE EXTENDED, ONLY SHORTENED, WHEN RE-EVALUATION
R1019        OF A JET FIRING TIME IS MADE ON A LATER PASS

R1020   CALLING SEQUENCE....

R1021       *ROLLDAP CALL VIA WAITLIST, IN PARTICULAR BY TVCEXEC (EVERY 1/2 SEC)
R1022        WITH A 3CS DELAY TO ALLOW FREE TIME FOR OTHER RUPTS (DWNRPT, ETC.)

R1023   NORMAL EXIT MODES.... ENDOFJOB

R1024   ALARM OR ABORT EXIT MODES.... NONE

R1025   SUBROUTINES CALLED.....NONE

R1026   OTHER INTERFACES....

R1027       *TVCEXEC SETS UP ROLLDAP TASK EVERY 1/2 SECOND AND UPDATES 1/CONACC
R1028        EVERY 10 SECONDS (VIA MASSPROP AND S40.15)
R1029       *TVCRESTART PACKAGE WILL RE-START ROLL DAP AFTER A RESTART (PICKING
R1030        UP THE ORIGINAL CGAD)

R1032   ERASABLE INITIALIZATION REQUIRED....

R1033       *1/CONACC   (S40.15)
R1034       *CGAD (CDUX, AT IGNOVER)
R1035       *CGANOW  (CDUX AT TVCINIT4 AND TVCEXECUTIVE)
R1036       *CGAPAST  (OGANOW AT TVCEXECUTIVE)
R10362      *ROLLFIRE = TEMREG = ROLLWORD = 0   (MRCLEAN LOOP IN TVCDAPON)
R1037   OUTPUT....

R1038       *ROLL JET PAIR FIRINGS

R1040   DEBRIS.... MISCELLANEOUS, SHAREABLE WITH RCS/ENTRY, IN EBANK6 ONLY
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P1041  SOME NOTES ON THE ROLL AUTOPILOT, AND IN PARTICULAR, ON ITS SWITCHING
R1042  LOGIC.  SEE SECTION THREE OF THE GSOP (SUNDISK/COLOSSUS) FOR DETAILS.


R1043  SWITCHING LOGIC IN THE PHASE PLANE....

R1044                                  OGARATE
R1045                                    *
R1046                                    *
R1047   * * * * * * * * * * * *            *
R1048                                    *      (REGION 1, SEE TEXT BELOW)
R1049                                *   *
R1050                                    *
R1051  * * * * * * *     (COAST)        *      ...PARABOLA (SWITCHING = CONTROL)
R1052                 *                  *    .
R1053                    *               *   *
R1054                       *            *                (FIRE NEG ROLL JETS)
R1055                          *         *       *
R1056        (-OE,+LMCRATE)....*         *
R1057                          *         *          *
R1058                          *         *                                OGAERROR
R1059  ***************************************************************************
R1060                                    *          *                  (-AK, OGAERR)
R1061                             *      *          *       (REGION 6-PRIME)
R1062                                    *          *       (SEE TEXT BELOW)
R1063                          *    *               *
R1064                                    *               *      ...STRAIGHT LINE
R1065     (FIRE PCS ROLL JETS)      *   *                    *  .
R1066                                    *    (COAST)           *
R1067                                    *                        * * * * * * * * * * *
R1068                                    *                              -MINLIM
R1069                                    *    *
R1070                                    *
R1071                                    *            * * * * * * * * * * * * * * * * * *
R1072                                    *                           -MAXLIM
R1073                                    *
R1074                                    *

R1075  SWITCHING PARABOLAS ARE CONTROL PARABOLAS, THUS REQUIRING KNOWLEDGE OF
R1076       CONTROL ACCELERATION CONACC, OR ITS RECIPROCAL, 1/CONACC, THE TVC
R1077       ROLL GAP GAIN  (SEE TVCEXECUTIVE VARIABLE GAIN PACKAGE).  JET
R1078       FIRING TIME IS SIMPLY THAT REQUIRED TO ACHIEVE THE DESIRED OGARATE,
R1079       SUBJECT TO THE LIMITATIONS DISCUSSED UNDER FUNCTIONAL DESCRIPTION,
R1080       ABOVE.

R1081  THE THREE CONTROL REGIONS  (+, -, AND ZERO TORQUE) ARE COMPRIZED OF
R1082       TWELVE SUBSET REGIONS  ( 1...6, AND THE CORRESPONDING 1-PRIME...
R1083       6-PRIME )  SEE SECTION 3 OF THE GSOP  (SUNDISK OR COLOSSUS)
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P1084   GIVEN THE OPERATING POINT NOT IN THE COAST REGION, THE DESIRED OGARATE
R1085         IS AT THE POINT OF PENETRATION OF THE COAST REGION BY THE CONTROL
R1086         PARABOLA WHICH PASSES THROUGH THE OPERATING POINT. FOR REGION 3
R1087         DESIRED OGARATE IS SIMPLY +-MAXLIM. FOR REGIONS 1 OR 6 THE SOLUTION
R1088         TO A QUADRATIC IS REQUIRED (THE PENETRATION IS ALONG THE STRAIGHT
R1089         LINE OR MINLIM BOUNDRY SWITCH LINES). AN APPROXIMATION IS MADE
R1090         INSTEAD. CONSIDER AN OPERATING POINT IN REGION 6. PASS A TANGENT TO
R1091         THE CONTROL PARABOLA THROUGH THE OPERATING POINT, AND FIND ITS
R1092         INTERSECTION WITH THE STRAIGHT LINE SECTION OF THE SWITCH CURVE...
R1093         THE INTERSECTION DEFINES DESIRED OGARATE. IF THE OPERATING POINT IS
R1094         CLOSE TO THE SWITCH LINE, THE APPROXIMATION IS QUITE GOOD (INDEED
R1095         THE APPROXIMATE AND QUADRATIC SOLUTIONS CONVERGE IN THE LIMIT AS
R1096         THE SWITCH LINE IS APPROACHED). IF THE OPERATING POINT IS NOT CLOSE
R1097         TO THE SWITCH LINE, THE APPROXIMATE SOLUTION GIVES VALID TREND
R1098         INFORMATION (DIRECTION OF DESIRED OGARATE) AT LEAST. THE
R1099         RE-EVALUATION OF DESIRED OGARATE IN SUBSEQUENT ROLL DAP PASSES (1/2
R1100         SECOND INTERVALS) WILL BENEFIT FROM THE CONVERGENT NATURE OF THE
R1101         APPROXIMATION.

R11021  FOR LARGE OGAERROR THE TANGENT INTERSECTS +-MINLIM SWITCH BOUNDRY BEFORE
R11022        INTERSECTING THE STRAIGHT LINE SWITCH. HOWEVER THE MINLIM IS
R11023        IGNORED IN COMPUTING THE FIRING TIME, SO THAT THE EXTENSION (INTO
R11024        THE COAST REGION) OF THE STRAIGHT LINE SWITCH IS WHAT IS FIRED TO.
R11025        IF THE ROLL DAP FINDS ITSELF IN THE COAST REGION BEFORE REACHING
R11026        THE DESIRED INTERSECTION (IE, IN THE REGION BETWEEN THE MINLIM
R11027        AND THE STRAIGHT LINE SWITCH) IT WILL EXIBIT NORMAL COAST-REGION
R11028        BEHAVIOR AND TURN OFF THE JETS. THE PURPOSE OF THIS FIRING POLICY
R11029        IS TO MAINTAIN STATIC ROLL STABILITY IN THE EVENT OF A JET
R1103         FAILED-ON.

R1113   WHEN THE OPERATING POINT IS IN REGION 1 THE SAME APPROXIMATION IS
R1114         MADE, BUT AT AN ARTIFICIALLY-CREATED OR DUMMY OPERATING POINT,
R1115         DEFINED BY.. OGAERROR = INTERSECTION OF CONTROL PARABOLA  AND
R1116         OGAERROR AXIS, OGARATE = +-LMGRATE WHERE SIGN IS OPPOSITE THAT OF
R1117         REAL OPERATING POINT RATE.  WHEN THE OPERATING POINT HAS PASSED
R1118         FROM REGION 1 TO REGION 6, THE DUMMY POINT IS NO LONGER REQUIRED,
R1119         AND THE SOLUTION REVERTS TO THAT OF A REGULAR REGION 6 POINT.


R1120   EQUATION FOR SWITCHING PARABOLA (SEE FIGURE ABOVE)....
R1121                                          2
R1122         SOGAERROR = (DB - (SOGARATE) (1/CONACC)/2) SGN(SOGARATE)


R1123   EQUATION FOR SWITCHING STRAIGHT LINE SEGMENT....

R1124         SOGARATE = -(-SLOPE)(SOGAERROR) - SGN(SOGARATE) INTERCEP

R1125                  WHERE  INTERCEP = DB(-SLOPE) - LMGRATE
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R1126   EQUATION FOR INTERSECTION, CONTROL PARABOLA AND STRAIGHT SWITCH LINE....

R1127         DOGADOT = NUM/DEN, WHERE
R1128                                  2
R1129              NUM = (-SLOPE)(OGARATE) (1/CONACC)
R1130                    +SGN(DELOGA)(-SLOPE)(OGAERROR - SGN(DELOGA)(DB))
R1131                    +LMGRATE

R1132              DEN = (-SLOPE)(OGARATE)(1/CONACC) - SGN(DELOGA)
R1133                                                2
R1134              DELOGA = OGAERROR - (DB - (OGADOT) (1/CONACC)/2)SGN(OGADOT)


R1135   FOR REGIONS 6 AND 6-PRIME  USE ACTUAL OPERATING POINT  (OGA, OGARATE)
R1136         FOR OGAERROR AND OGARATE IN THE INTERSECTION EQUATIONS ABOVE.
R1137         FOR REGIONS 1 AND 1-PRIME  USE DUMMY OPERATING POINT FOR OGAERROR
R1138         AND OGARATE,  WHERE THE DUMMY POINT IS GIVEN BY....
R1139         OGAERROR= DELOGA + DB SGN(OGARATE)
R1140         OGARATE= -LMGRATE SGN(OGARATE)

R1141   NOTE, OGAERROR = OGA - OGAD  USES DUMMY REGISTER  OGA IN ROLL DAP CODING
R1142         ALSO,AT POINT WHERE DOGADOT IS COMPUTED, REGISTER DELOGA IS USED
R1143         AS A DUMMY REGISTER FOR THE OGAERROR IN THE NUM EQUATION ABOVE
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P11432 ROLLDAP CODING....

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 2000   REF   3  LAST  914   16,2000                        SETLOC DAPRCLL
 2001                       16,3312                        BANK
 2002   REF   9  LAST  901   E6,1672                        EBANK= OGANCW
 2003   REF   1                                            COUNT* $$/RCLL
 2006   REF  10  LAST  949   16,3312  31'672 C  ROLLDAP    CAE    OGANCW      OGA RATE ESTIMATOR...SIMPLE FIRST-ORDER
 2007                       16,3313  0 0006 1              EXTEND                 DIFFERENCE (SAMPLE TIME = 1/2 SEC)
 2008   REF   3  LAST  901   16,3314  21'673 C              MSU    OGAPAST
 2009                       16,3315  0 0006 1              EXTEND
 2010   REF  34  LAST  903   16,3316  7 4706 C              MP     BIT5
 2011   REF 205  LAST  942   16,3317  22 000 1              LXCH   A
 2012   REF   1               16,3320  55'533 1              TS     OGARATE     SC.AT 8-4 REV/SEC

R2017   COMPUTATIONS WHICH FOLLOW USE OGA FOR OGAERR (SAME REGISTER)
R2018   EXAMINE DURATION OF LAST ROLL FIRING IF JETS ARE NOW ON.
 2019   REF   2  LAST  101   16,3321  3 1611 C  DURATION   CA     ROLLFIRE    SAME SGN AS PRESENT TORQ,MAGN=POSMAX
 2020                       16,3322  0 0006 1              EXTEND
 2021                       16,3323  1 3325 1              BZF    +2          ROLL JETS ARE NOW OFF.
 2022   REF   1               16,3324  1 3333 C              TCF    ROLLOGIC    ENTER LOGIC,JETS NOW ON.

 2023   REF   2  LAST  101   16,3325  31'613 1              CAE    TEMREG      EXAMINE LAST FIRING INTERVAL
 2024                       16,3326  0 0006 1              EXTEND                 IF POSITIVE, DONT FIRE
 2025   REF   2  LAST  949   16,3327  1 3333 C              BZF    ROLLOGIC    ENTER LOGIC, JETS NOW OFF.
 2026   REF 164  LAST  942   16,3330  3 4714 1              CAF    ZERO        JETS HAVE NOT BEEN OFF FOR 1/2 SEC. WAIT
 2027   REF   3  LAST  949   16,3331  55'613 C              TS     TEMREG      RESET TEMREG
 2028   REF  46  LAST  906   16,3332  1 5213 C  WAIT1/2     TCF    TASKOVER    EXIT ROLL DAP

R2029   COMPUTE DB=(1/2 CONACC) (OGARATE)SQ  (1/2 IN THE SCALING)
 2030   REF   2  LAST  949   16,3333  4 1533 1  ROLLOGIC    CS     OGARATE     SCALED AT 2(-4) REV/SEC
 2031                       16,3334  0 0006 1              EXTEND
 2032   REF   4  LAST  907   16,3335  7 1650 1              MP     1/CONACC    SCALED AT 2(+9) SEC SQ /REV
 2033                       16,3336  0 0006 1              EXTEND
 2034   REF   3  LAST  949   16,3337  7 1533 1              MP     OGARATE
 2035   REF   1               16,3340  6 3722 C              AD     DB          SCALED AT 2(+0) REV
 2036   REF   4  LAST  949   16,3341  55'613 C              TS     TEMREG      QUANTITY SCALED AT 2(+0) REV.

R2037   GET SIGN OF OGARATE
 2038   REF   4  LAST  949   16,3342  3 1533 C              CA     OGARATE
 2039                       16,3343  C 0006 1              EXTEND
 2040                       16,3344  6 3347 1              BZMF   +3          LET SGN(0) BE NEGATIVE
 2041   REF  64  LAST  897   16,3345  3 4712 1              CA     BIT1
 2042                       16,3346  1 3350 C              TCF    +2
 2043   REF  65  LAST  949   16,3347  4 4712 C              CS     BIT1
 2044   REF   2  LAST  102   16,3350  55'676 C              TS     SGNRT       + OR -  2(-14)

R2045   CALCULATE DISTANCE FROM SWITCH PARABOLA,DELOGA
 2046                       16,3351  0 0006 1              EXTEND
 2047   REF   5  LAST  949   16,3352  7 1613 C              MP     TEMREG      SGN(OGARATE) TEMREG NOW IN L
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 2048   REF 102  LAST  942   16,3353  4 0001 1            CS     L
 2049   REF   3  LAST  102   16,3354  6 1674 C            AD     OGA          SCALED AT 2(+0) REV
 2050   REF   2  LAST  102   16,3355  55'677 1 DELOGAC    TS     DELOGA       SC.AT B+0 REV, PLUS TO RIGHT OF C-PARAB
R2051   EXAMINE SGN(DELOGA) AND CREATE CA OR CS INSTR. DEPENDING UPON SIGN.
 2052                         16,3356  0 0006 1            EXTEND
 2053                         16,3357  6 3362 C            BZMF   +3
 2054   REF  12  LAST  689   16,3360  3 4371 C            CAF    PRIO30       =CA  (30000)
 2055                         16,3361  1 3363 C            TCF    +2
 2056   REF  38  LAST  903   16,3362  3 4674 C            CAF    BIT15        =CS  (40000)
 2057   REF   2  LAST  102   16,3363  55'700 C            TS     I

 2058   REF   3  LAST  950   16,3364  51'700 1            INDEX  I            TSET ON  I SGN(OGARATE)
 2059   REF   3  LAST  949   16,3365  0 1676 1            0      SGNRT        CA OR CS
 2060                         16,3366  4 0000 C            COM
 2061                         16,3367  0 0006 1            EXTEND
 2062   REF   1              16,3370  6 3441 C REG1TST    BZMF   ROLLON       IF REGION 1 (DELOGA OGARATE SAME SIGN)

R2063   NO JET FIRE YET. TEST FOR MAX OGARATE
 2064   REF   4  LAST  950   16,3371  51'700 1            INDEX  I
 2065   REF   5  LAST  949   16,3372  0 1533 C            0      OGARATE      CA OR CS...BOTH MUST BE NEG. HERE
 2066   REF   2  LAST  102   16,3373  55'701 1            TS     IOGARATE     I.E. I OGARATE
 2067   REF   1              16,3374  6 3730 C            AD     MAXLIM       SCALED AT 2(-4) REV/SEC
 2068                         16,3375  0 0006 1            EXTEND
 2069   REF   1              16,3376  6 3520 C REG3TST    BZMF   RATELIM      IF REGION 3 (RATES TOO HIGH, FIRE JETS)

R2070   COMPUTATION OF I((-SLOPE)OGA + OGARATE) - INTERCEPT..NOTE THAT STR. LINE
R2071   SWITCH SLOPE IS (SLOPE) DEG/SEC/DEG,A NEG. QUANTITY
 2072   REF   6  LAST  950   16,3377  3 1533 C            CA     OGARATE
 2073                         16,3400  0 0006 1            EXTEND
 2074   REF  50  LAST  929   16,3401  7 4675 C            MP     BIT14
 2075   REF   6  LAST  949   16,3402  55'613 C            TS     TEMREG
 2076   REF   4  LAST  950   16,3403  3 1674 C            CA     OGA
 2077                         16,3404  0 0006 1            EXTEND
 2078   REF   1              16,3405  7 3723 C            MP     -SLOPE
 2079                         16,3406  20 001 1            DDOUBL
 2080                         16,3407  20 001 1            DDOUBL
 2081                         16,3410  20 001 1            DDOUBL               (OGA ERROR MUST BE LESS THAN +-225 DEG)
 2082   REF   7  LAST  950   16,3411  6 1613 1            AD     TEMREG

 2083   REF   5  LAST  950   16,3412  51'700 1            INDEX  I
 2084   REF 206  LAST  949   16,3413  0 0000 1            0      A            I((-SLOPE)OGA+OGARATE) AT 2(-3)REV/SEC
 2085                         16,3414  4 0000 C            COM
 2086   REF   1              16,3415  6 3725 1            AD     INTERCEP     SCALED AT 2(-3) REV.
 2087                         16,3416  4 0000 C            COM
 2088                         16,3417  0 0006 1            EXTEND
 2089   REF   1              16,3420  6 3625 C REG2TST    BZMF   NOROLL       IF REGION 2 (COAST SIDE OF STRT LINE)

R2090   CHECK TO SEE IF OGARATE IS ABOVE MINLIM
 2091   REF   3  LAST  950   16,3421  3 1701 C            CA     IOGARATE     ALWAYS NEGATIVE
 2092   REF   1              16,3422  6 3726 1            AD     MINLIM       SCALED AT 2(-4) REV/SEC
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 2093                          16,3423  0 0006 1           EXTEND
 2094  REF   2 LAST  950       16,3424  6 3625 0  REG4TST  BZMF   NOROLL          IF REGION 4 (COAST SIDE OF MINLIM)

R2095  ALL AREAS CHECKED EXCEPT LAST AREA...NO FIRE IN THIS SMALL SEGMENT
 2096  REF   6 LAST  950       16,3425  51'700 1           INDEX  I
 2097  REF   5 LAST  950       16,3426  0 1674 0           0      OGA
 2098                          16,3427  4 0000 0           COM
 2099  REF   2 LAST  949       16,3430  6 3722 0           AD     DB
 2100                          16,3431  4 0000 0           COM
 2101                          16,3432  0 0006 1           EXTEND
 2102  REF   3 LAST  951       16,3433  6 3625 0  REG5TST  BZMF   NOROLL          IF REGION 5 (COAST SIDE OF DB)


R2103  JETS MUST FIRE NOW.OGARATE IS NEG.(OR VISA VERSA).USE DIRECT STR. LINE.
R2104  DELOGA AND DELOGART ARE USED AS DUMMY VARIABLES IN THE SOLUTION OF A
R2105  STRAIGHT LINE APPROXIMATION TO A QUADRATIC SOLUTION OF THE INTERSECTION
R2106  OF THE CONTROL PARABOLA AND THE STRAIGHT-LINE SWITCH LINE. THE STRAIGHT
R2107  LINE IS THE TANGENT TO THE CONTROL PARABOLA AT THE OPERATING POINT. (FOR
R2108  OPERATING POINTS IN REGIONS  6 AND 6-PRIME)
 2109  REF   6 LAST  951       16,3434  31'674 0  REGION6  CAE    OGA            USE ACTUAL OPERATING POINT FOR TANGENT
 2110  REF   3 LAST  950       16,3435  55'677 1           TS     DELOGA         ACTUAL STATE
 2111  REF   7 LAST  950       16,3436  3 1533 0           CA     OGARATE
 2112  REF   2 LAST  102       16,3437  55'675 0           TS     DELOGART       ACTUAL STATE,I.E. DEL OGARATE
 2113  REF   1                 16,3440  1 3450 1           TCF    ONROLL

R2114  JETS ALSO FIRE FROM HERE EXCEPT OGARATE IS POS(VISA VERSA),USE INDIRECT
R2115  STRAIGHT LINE ESTABLISHED BY TANGENT TO A CONTROL PARABOLA AT   ((DELOGA
R2116  + DB SGN(DELOGA) ), -LMCRATE SGN(DELOGA) )          (THIS IS THE DUMMY
R2117  OPERATING POINT FOR OPERATING POINTS IN REGIONS 1 AND 1-PRIME )
 2118  REF   7 LAST  951       16,3441  51'700 1  ROLLON   INDEX  I
 2119  REF   3 LAST  951       16,3442  0 3722 0           0      DB
 2120  REF   4 LAST  951       16,3443  27'677 1           ADS    DELOGA         DELOGA WAS DIST. FROM SWITCH PARABOLA

 2121  REF   1                 16,3444  4 3724 1           CS     LMCRATE        LIMIT CYCLE RATE AT 2(-4) REV/SEC
 2122  REF   8 LAST  951       16,3445  51'700 1           INDEX  I
 2123  REF 207 LAST  950       16,3446  0 0000 1           0      A
 2124  REF   3 LAST  951       16,3447  55'675 0           TS     DELOGART       EVALUATE STATE FOR INDIRECT LINE.

R2125  SOLVE STRAIGHT LINES SIMULTANEOUSLY TO OBTAIN DESIRED OGARATE.
 2126                          16,3450  0 0006 1  ONROLL   EXTEND                DELOGART IN ACC. ON ARRIVAL
 2127  REF   5 LAST  949       16,3451  7 1650 1           MP     1/CONACC
 2128                          16,3452  6 0000 1           DOUBLE
 2129                          16,3453  0 0006 1           EXTEND
 2130  REF   2 LAST  950       16,3454  7 3723 0           MP     -SLOPE
 2131  REF   8 LAST  950       16,3455  55'613 0           TS     TEMREG         2(-SLOPE)RATE /CONACC
 2132                          16,3456  0 0006 1           EXTEND
 2133  REF   4 LAST  951       16,3457  7 1675 0           MP     DELOGART
 2134  REF   5 LAST  951       16,3460  55'675 0           TS     DELOGART       2(-SLOPE)(RATESQ)/CONACC
 2135  REF  26 LAST  943       16,3461  4 4700 0           CS     BIT11
 2136  REF   9 LAST  951       16,3462  51'700 1           INDEX  I
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2137   REF 208  LAST  951   16,3463  0 0000 1           0       A
2138   REF   9  LAST  951   16,3464  27'613 0  RATEDEN  ADS     TEMREG      DENOMINATOR COMPLETED

2139   REF  10  LAST  951   16,3465  51'700 1           INDEX   I
2140   REF   5  LAST  951   16,3466  0 1677 0           0       DELOGA
2141                        16,3467  4 0000 0           COM
2142   REF   4  LAST  951   16,3470  6 3722 0           AD      DB
2143                        16,3471  4 0000 0           COM
2144                        16,3472  0 0006 1           EXTEND
2145   REF   3  LAST  951   16,3473  7 3723 0           MP      -SLOPE
2146   REF   6  LAST  951   16,3474  27'675 0           ADS     DELOGART
2147   REF   2  LAST  951   16,3475  3 3724 0           CA      LMCRATE
2148                        16,3476  0 0006 1           EXTEND
2149   REF  27  LAST  951   16,3477  7 4700 0           MP      BIT11
2150   REF   7  LAST  952   16,3500  6 1675 1  RATENUM  AD      DELOGART    NUMERATOR COMPLETED

2151   REF 103  LAST  950   16,3501  56 001 0           XCH     L           PLACE NUMERATOR IN L FOR OVERFL. CHECK
2152   REF 165  LAST  949   16,3502  3 4714 1           CA      ZERO
2153                        16,3503  0 0006 1           EXTEND
2154   REF  10  LAST  952   16,3504  11'613 0           DV      TEMREG      OVERFLOW, IF ANYTHING, NOW APPEARS IN A
2155                        16,3505  0 0006 1           EXTEND
2156   REF   1              16,3506  1 3514 0           BZF     DVOK        NO OVERFLOW....(0,L)/TEMREG = 0,L

2157   REF 209  LAST  952   16,3507  10 000 0  MINLIMAP CCS     A
2158   REF  19  LAST  897   16,3510  3 4672 0           CAF     POSMAX          POSITIVE OVERFLOW
2159   REF   1              16,3511  1 3523 1           TCF     ROLLSET
2160   REF  20  LAST  952   16,3512  4 4672 1           CS      POSMAX          NEGATIVE OVERFLOW
2161   REF   2  LAST  952   16,3513  1 3523 1           TCF     ROLLSET

2162   REF 210  LAST  952   16,3514  22 000 1  DVOK     LXCH    A           PUT NUMERATOR BACK INTO A, 0 IN L
2163                        16,3515  0 0006 1           EXTEND
2164   REF  11  LAST  952   16,3516  11'613 0           DV      TEMREG      RESULT OF DIVISION IS DESIRED OGARATE
2165   REF   3  LAST  952   16,3517  1 3523 1           TCF     ROLLSET         ( SCALED AT B-4 REV/SEC )


2173   REF   2  LAST  950   16,3520  4 3730 1  RATELIM  CS      MAXLIM
2174   REF  11  LAST  952   16,3521  51'700 1           INDEX   I
2175   REF 211  LAST  952   16,3522  0 0000 1           0       A           IF I = CA, DESIRED RATE IS   -MAXLIM

R2176  BASED ON DESIRED RATE - PRESENT RATE,COMPUTE JET FIRE TIME
2177   REF  12  LAST  952   16,3523  55'613 0  ROLLSET  TS      TEMREG      STORE DESIRED OGARATE (SCALED B-4)
21771                       16,3524  0 0006 1           EXTEND
2178   REF   8  LAST  951   16,3525  61'533 0           SU      OGARATE     RATE DIFF. SCALED AT 2(-4) REV/SEC
21781  REF 212  LAST  952   16,3526  54 000 0           TS      A               OVERFLOW PROTECT
21782  REF  13  LAST  952   16,3527  55'613 0           TS      TEMREG              "       "
2179                        16,3530  0 0006 1           EXTEND
2180   REF   1              16,3531  7 7665 1           MP      T6SCALE     T6SCALE = 8/10.24
2181                        16,3532  0 0006 1           EXTEND
2182   REF   6  LAST  951   16,3533  7 1650 1           MP      1/CONACC    SCALED AT 2(+9) SECSQ/REV
2183                        16,3534  20 001 1           DDOUBL
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 21831  REF  14  LAST  952   16,3535  55'613 C          TS      TEMREG          OVERFLOW PROTECT
 2184                       16,3536  20 001 1          DDOUBL
 21841  REF 213  LAST  952   16,3537  54 000 C          TS      A               OVERFLOW PROTECT
 2185   REF  15  LAST  953   16,3540  55'613 C          TS      TEMREG          JET FIRE TIME AT 625 MICROSEC/BIT
 2186                       16,3541  0 0006 1          EXTEND                  POS MEANS POSITIVE ROLL TORQUE.
 2187   REF   4  LAST  951   16,3542  1 3625 1          BZF     NOROLL

R2188   JET FIRE TIME IS NZ, ARE JETS ON NOW.
 21881  REF  16  LAST  953   16,3543  31'613 1          CAE     TEMREG          DESIRED CHANGE IN OGARATE
 2189                       16,3544  0 0006 1          EXTEND
 2190   REF   3  LAST  949   16,3545  7 1611 1          MP      ROLLFIRE        (SGN OF TORQUE..ZERO IF JETS NOW OFF)
 2191   REF 214  LAST  953   16,3546  10 000 C          CCS     A
 2192   REF   1              16,3547  1 3553 C          TCF     MOREROLL        CONTINUE FIRING WITH PRESENT POLARITY
 2193   REF   1              16,3550  1 3556 C          TCF     NEWRCLL         START NEW FIRING NOW, PLUS
 2194   REF   5  LAST  953   16,3551  1 3625 1          TCF     NOROLL          TERMINATE OLD FIRING, NEW SIGN REQUESTED
 2195   REF   2  LAST  953   16,3552  1 3556 C          TCF     NEWRCLL         START NEW FIRING NOW, MINUS

R2196   CONTINUE PRESENT FIRING
 2197   REF 166  LAST  952   16,3553  3 4714 1  MOREROLL CAF     ZERO
 2198   REF  12  LAST  952   16,3554  55'700 C          TS      I               USE TEMP. AS MOREROLL SWITCH
 2199   REF   1              16,3555  1 3567 1          TCF     MAXTFIRE

R2200   START NEW FIRING BUT CHECK IF GREATER THAN MINIMUM FIRE TIME.
 2201   REF  17  LAST  953   16,3556  11'613 0  NEWROLL  CCS     TEMREG          CALL THIS T6FIRE
 2202   REF 100  LAST  944   16,3557  6 4712 1          AD      ONE
 2203                       16,3560  1 3562 1          TCF     +2
 2204   REF 101  LAST  953   16,3561  6 4712 1          AD      ONE
 2205                       16,3562  4 0000 C          COM                     -MAG(T6FIRE)
 2206   REF   1              16,3563  6 3731 1          AD      TMINFIRE        TMINFIRE-MAG(T6FIRE)
 2207                       16,3564  4 0000 0          COM
 2208                       16,3565  0 0006 1          EXTEND
 2209   REF   6  LAST  953   16,3566  6 3625 0  MINTST   BZMF    NOROLL          IF NOT GREATER THAN TMINFIRE (NEW FIRE)

R2210   PROCEED WITH NEW FIRING BUT NOT LONGER THAN TMAXFIRE
 2211   REF  18  LAST  953   16,3567  3 1613 1  MAXTFIRE CA      TEMREG
 2212                       16,3570  0 0006 1          EXTEND
 2213   REF   1              16,3571  7 4710 1          MP      1/TMXFIR        I.E. 1/TMAXFIRE
 2214                       16,3572  0 0006 1          EXTEND
 2215   REF   1              16,3573  1 3601 1  MAXTST   BZF     NOMXFIRE        IF LESS THAN TMAXFIRE

 2216   REF 215  LAST  953   16,3574  10 000 C          CCS     A
 2217   REF   1              16,3575  3 3732 1          CAF     TMAXFIRE        USE MAXIMUM
 2218                       16,3576  1 3600 C          TCF     +2
 2219   REF   2  LAST  953   16,3577  4 3732 C          CS      TMAXFIRE        USE MAXIMUM
 2220   REF  19  LAST  953   16,3600  55'613 C          TS      TEMREG

R2221   SET UP SIGN OF REQUIRED TORQUE
 2222   REF  20  LAST  953   16,3601  11'613 C  NOMXFIRE CCS     TEMREG          FOR TORQUE SIGN
 2223   REF  21  LAST  952   16,3602  3 4672 0          CA      POSMAX          POSITIVE TORQUE REQUIRED
 2224                       16,3603  1 3605 C          TCF     +2
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2225   REF   4  LAST  933   16,3604  3 4674 C            CA     NEGMAX     NEGATIVE TORQUE REQUIRED
2226   REF   4  LAST  953   16,3605  55'611 1            TS     ROLLFIRE   SET ROLLFIRE FOR + OR - TORQUE

2227                        16,3606  4 0000 C            COM                COMPLEMENT... POS. FOR NEG. TORQUE
2228                        16,3607  0 0006 1            EXTEND
2229                        16,3610  6 3613 C            BZMF   +3         POSITIVE TORQUE REQUIRED
2230   REF  21  LAST  953   16,3611  4 1613 C            CS     TEMREG
2231   REF  22  LAST  954   16,3612  55'613 C            TS     TEMREG

2232   REF  13  LAST  953   16,3613  3 1700 1  FIRELOOK  CA     I          IS IT MOREROLL
2233                        16,3614  0 0006 1            EXTEND
2234   REF   1              16,3615  1 3617 C            BZF    FIREPLUG   YES
2235   REF   1              16,3616  1 3630 C            TCF    JETROLL    MAG(T6FIRE) NOW IN TEMREG

2236   REF   1              16,3617  30 031 C  FIREPLUG  CAE    TIME6      CHECK FOR EXTENDED FIRING
2237                        16,3620  0 0006 1            EXTEND
2238   REF  23  LAST  954   16,3621  61'613 1            SU     TEMREG
2241                        16,3622  0 0006 1            EXTEND
2242   REF  47  LAST  949   16,3623  6 5213 1  EXTENTST  BZMF   TASKOVER   IF EXTENSION WANTED, DONT, EXIT ROLL DAP
2243   REF   2  LAST  954   16,3624  1 3630 C            TCF    JETROLL

2244   REF 167  LAST  953   16,3625  4 4714 C  NOROLL    CS     ZERO       COAST....(NEG ZERO FOR TIME6)
2245   REF   5  LAST  954   16,3626  55'611 1            TS     ROLLFIRE   NOTE, JETS CAN FIRE NEXT PASS
2246   REF  24  LAST  954   16,3627  55'613 C            TS     TEMREG

2247                        16,3630  0 0006 1  JETROLL   EXTEND
2248   REF   1              16,3631  3 3721 C            DCA    NOROLIT6
2249   REF   2  LAST  126   16,3632  53'311 1            DXCH   T6LOC
2250   REF  25  LAST  954   16,3633  3 1613 1            CA     TEMREG     ENTER JET FIRING TIME
2251   REF   2  LAST  954   16,3634  54 031 1            TS     TIME6

2252   REF  14  LAST  954   16,3635  3 1700 1            CA     I          I=0 IF MOREROLL,KEEP SAME JETS ON
2253                        16,3636  0 0006 1            EXTEND
2254   REF  48  LAST  954   16,3637  1 5213 C  SAMEJETS  BZF    TASKOVER   IF JETS ON KEEP SAME JETS. EXIT ROLL DAP

2255   REF   6  LAST  954   16,3640  11'611 1            CCS    ROLLFIRE
2256   REF   1              16,3641  1 3645 1            TCF    +TORQUE
2257   REF   1              16,3642  1 3706 1            TCF    T6ENABL
2258   REF   1              16,3643  1 3666 C            TCF    -TORQUE
2259   REF   2  LAST  954   16,3644  1 3706 1            TCF    T6ENABL

R2260  PROCEED WITH + TORQUE
2261   REF   2  LAST  101   16,3645  3 1612 C  +TORQUE   CA     ROLLWORD    WHAT WAS THE LAST +TORQUE COMBINATION
2262   REF  66  LAST  949   16,3646  7 4712 C            MASK   BIT1       WAS IT NO.9-11
2263                        16,3647  0 0006 1            EXTEND
2264   REF   1              16,3650  1 3660 C            BZF    NO.9-11    NOT 9-11, SO USE IT THIS TIME

2265   REF  67  LAST  954   16,3651  4 4712 C  NO.13-15  CS     BIT1
2266   REF   3  LAST  954   16,3652  7 1612 1            MASK   ROLLWORD
2267   REF   4  LAST  954   16,3653  55'612 1            TS     ROLLWORD   CHANGE BIT 1 TO ZERO
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2268  REF   1                16,3654  3 4732 C            CAF     +ROLL2
2269                           16,3655  0 0006 1            EXTEND
2270  REF   2  LAST  178      16,3656  01 006 C            WRITE   CHAN6
2271  REF   3  LAST  954      16,3657  1 3706 1            TCF     T6ENABL

2272  REF  68  LAST  954      16,3660  3 4712 1  NO.9-11   CAF     BIT1        1ST + JETS TO FIRE (MRCLEAN OS ROLLWORD)
2273  REF   5  LAST  954      16,3661  27'612 1            ADS     ROLLWORD    CHANGE BIT 1 TO ONE
2274  REF   1                16,3662  3 4715 C            CAF     +ROLL1
2275                           16,3663  0 0006 1            EXTEND
2276  REF   3  LAST  955      16,3664  01 006 C            WRITE   CHAN6
2277  REF   4  LAST  955      16,3665  1 3706 1            TCF     T6ENABL

2278  REF   6  LAST  955      16,3666  3 1612 C  -TORQUE    CA      ROLLWORD     WHAT WAS LAST -TORQUE COMBINATION
2279  REF  38  LAST  943      16,3667  7 4711 C            MASK    BIT2        WAS IT NO.12-10
2280                           16,3670  0 0006 1            EXTEND
2281  REF   1                16,3671  1 3701 C            BZF     NO.12-10    NOT 12-10, SO USE IT THIS TIME

2282  REF  39  LAST  955      16,3672  4 4711 C  NO.16-14   CS      BIT2
2283  REF   7  LAST  955      16,3673  7 1612 1            MASK    ROLLWORD
2284  REF   8  LAST  955      16,3674  55'612 1            TS      ROLLWORD    CHANGE BIT 2 TO ZERO
2285  REF   1                16,3675  3 3733 C            CAF     -ROLL2
2286                           16,3676  0 0006 1            EXTEND
2287  REF   4  LAST  955      16,3677  01 006 C            WRITE   CHAN6
2288  REF   5  LAST  955      16,3700  1 3706 1            TCF     T6ENABL

2289  REF  40  LAST  955      16,3701  3 4711 1  NO.12-10  CAF     BIT2        1ST -JETS TO FIRE (MRCLEAN OS ROLLWORD)
2290  REF   9  LAST  955      16,3702  27'612 1            ADS     ROLLWORD    CHANGE BIT 2 TO ONE
2291  REF   1                16,3703  3 4377 C            CAF     -ROLL1
2292                           16,3704  0 0006 1            EXTEND
2293  REF   5  LAST  955      16,3705  01 006 C            WRITE   CHAN6

2294  REF  39  LAST  95C      16,3706  3 4674 C  T6ENABL    CAF     BIT15
2295                           16,3707  0 0006 1            EXTEND
2296  REF   8  LAST  575      16,3710  05 013 C            WOR     CHAN13
2297  REF  49  LAST  954      16,3711  1 5213 C  RDAPEND    TCF     TASKOVER    EXIT ROLL DAP
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L TVCROLLGAP USER'S PAGE NO. 12 E6 S3

P2298 THIS T6 TASK SHUTS OFF ALL ROLL JETS

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2299  REF  15  LAST  933   16,3712  22 016 C  NOROLL1  LXCH   BANKRUPT     SHUT OFF ALL (ROLL) JETS, (A T6 TASK
2300  REF 168  LAST  954   16,3713  3 4714 1            CAF    ZERO            CALLED BY ..JETROLL..)
2301  REF   7  LAST  954   16,3714  55'611 1            TS     ROLLFIRE     ZERO INDICATES JETS NOW OFF
2302                       16,3715  0 0006 1            EXTEND
2303  REF   6  LAST  955   16,3716  01 006 C  KILLJETS  WRITE  CHAN6
2304  REF   4  LAST  933   16,3717  1 5224 1            TCF    NOQRSM
```

P2305 CONSTANTS FOR ROLL AUTOPILOT....

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 2306   REF  10  LAST  920    E6,1742                          EBANK= BZERO
 2307   REF   1               16,3720   03712 C  NOROLLT6 2CADR  NOROLL1
 2307   REF   1               16,3721   34066 C

 2309                         16,3722   00344 1  DB        DEC    .01388889        DEAD BAND (5 DEG), SC.AT B+0 REV

 2310                         16,3723   06315 C  -SLOPE    DEC    0.2              -SWITCHLINE SLOPE(0.2 PER SEC) SC.AT B+0
A2311                                                                                    PER SEC
 2312                         16,3724   00111 0  LMCRATE   DEC    .00027778 B+4    LIMIT CYCLE RATE (0.1 DEG/SEC) SC.AT
A2313                                                                                    B-4 REV/SEC
 2314                         16,3725   00510 C  INTERCEP  DEC    .0025 B+3        DB(-SLOPE) - LMCRATE,  SC.AT  B-3 REV/SC

 2315                         16,3726   01330 0  MINLIM    DEC    .00277778 B+4    RATELIM,MIN (1DEG/SEC), SC.AT B-4 REV/SC

 2316                         16,3727   00027 1  1/MINLIM  DEC    360 B-18         RECIPROCAL THEREOF, SHIFTED 14 RIGHT

 2317                         16,3730   07071 0  MAXLIM    DEC    .01388889 B+4    RATELIM,MAX (5DEG/SEC), SC.AT B-4 REV/SC

 2318                         16,3731   00030 1  TMINFIRE  DEC    1.5 B+4          15 MS  (14 MIN),  SC.AT 16 BITS/CS

 2319                         16,3732   07640 1  TMAXFIRE  DEC    250 B+4          2.5 SEC, SC.AT 16 BITS/CS

 2320   REF  28  LAST  938      4710             1/TMXFIR  =      BIT3             RECIPROCAL THEREOF, SHIFTED 14 RIGHT,
A23201                                                                                  ROUNDS TO OCT00004, SO ALLOWS 2.56
A23202                                                                                  SEC FIRINGS BEFORE APPLYING LIMIT
23203   REF   3  LAST  527      7665             T6SCALE   =      PRIO31           (8+3) (16BITS/CS) (100CS/SEC)

 2321   REF  22  LAST  903      4715             +ROLL1    =      FIVE             ONBITS FOR JETS 9 AND 11
 2322   REF   2  LAST  196      4732             +ROLL2    =      OCT120           ONBITS FOR JETS 13 AND 15
 2323   REF   5  LAST  642      4377             -ROLL1    =      TEN              ONBITS FOR JETS 12 NAD 10
 2324                         16,3733   00240 1  -ROLL2    OCT    240              ONBITS FOR JETS 16 AND 14
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L TVCGEN3FILTERS USER'S PAGE NO. 1 E0 S3

R1000 PROGRAM NAME.... GEN3DAP FILTERS, CONSISTING OF NPONODE, NP1NODE, NYONODE, NY1NODE, ETC.
R1002 LCC SECTION.... GEN3DAP FILTERS SUBROUTINE....DAPCSM
R1003 MCC BY ENGEL 20 OCT, 1967

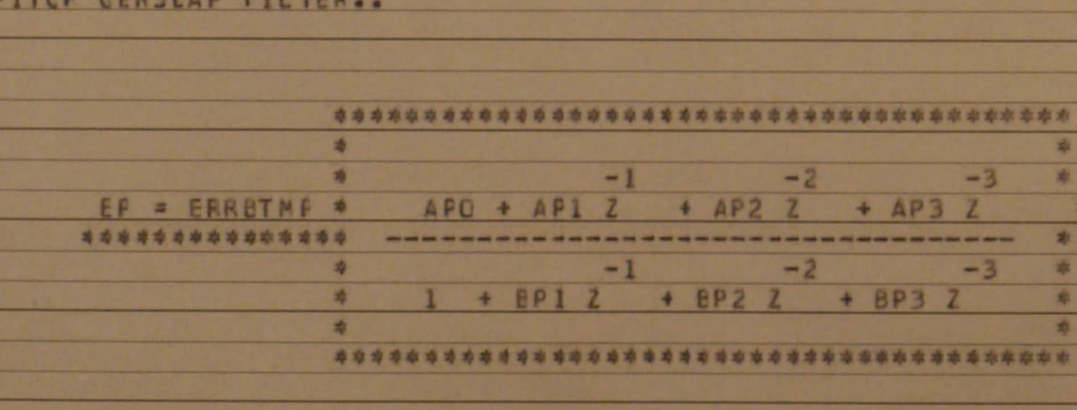
R1004 FUNCTIONAL DESCRIPTION....

R1005 THE GEN3DAP FILTER PACKAGE IS DESIGNED TO PROVIDE FLEXIBLE, LAST-MINUTE CHANGEABLE DIGITAL AUTOPILOT
R1007 FILTERS FOR LEM-OFF FLIGHT. GROUNDRULES FOR THE DESIGN AND USE OF THE PACKAGE ARE AS FOLLOWS.....

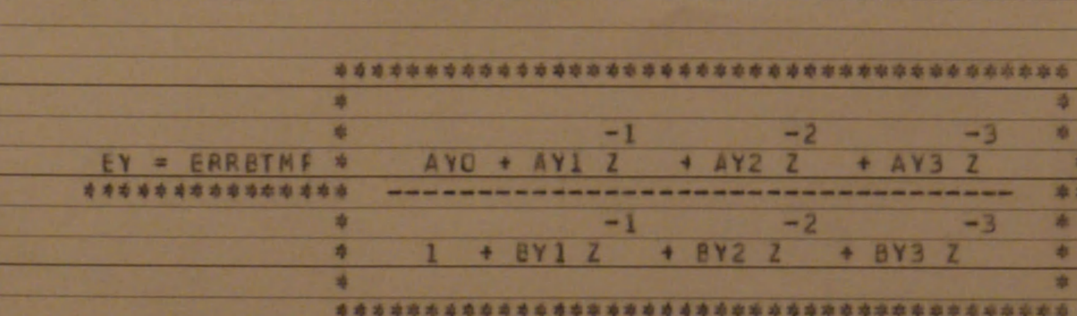
R1009 1. FILTER COEFFICIENTS AND GAINS IN ERASABLE MEMORY
R1011 2. UP TO THIRD-ORDER NUMERATOR OR DENOMINATOR
R1013 3. OPERATIONAL FIT WITHIN THE STRUCTURE OF THE REGULAR LEM-ON DAP CODING
R1015 4. DENOMINATOR POLES INSIDE THE Z-PLANE UNIT CIRCLE
R1017 5. NUMERATOR ZEROS INSIDE THE Z-PLANE DOUBLE-UNIT CIRCLE
R1019 6. HIGH FREQUENCY (BODE) GAIN LESS THAN 8ASCREVS, OR 8.6380088 DEG/DEG

R1021 THE FILTERS ARE SHOWN IN THE FOLLOWING DIAGRAMS.....

R1023 PITCH GEN3DAP FILTER..



R1047 YAW GEN3DAP FILTER..



P1071 THE IMPLEMENTING EQUATIONS FOR THESE FILTERS ARE AS FOLLOWS.....

	PITCH GEN3DAP....	YAW GEN3DAP....
R1073		
R1075	NPD = (B+4) KPGEN3 NPO	NYD = (B+4) KYGEN3 NYO
R1077	NPO = APO EP +4(Z-1) NP1	NYO = AYO EY +4(Z-1) NY1
R1079	NY1 = AP1 EP - BP1 NPO + (Z-1) NP2	NY1 = AY1 EY - BY1 NYO + (Z-1) NY2
R1081	NP2 = AP2 EP - BP2 NPO + (Z-1) NP3	NY2 = AY2 EY - BY2 NYO + (Z-1) NY3
R1083	NP3 = AP3 EP - BP3 NPO	NY3 = AY3 EY - BY3 NYO

R1085 FILTER INPUTS EP AND EY ARE PICKED UP FROM REGULAR LEM-CN CODING AT ERRBTMP (UPPER WORD ONLY), THUS ARE
R1087 SINGLE PRECISION QUANTITIES SCALED AT B-1 REVS. FILTER OUTPUTS NPD AND NYD ARE LEFT IN DOUBLE PRECISION AT
R1089 CMDTMP, SCALED AT 1 ASCREV, READY FOR OUTPUT PROCESSING VIA REGULAR LEM-ON CODING AT ..P,YOFFSET..
R1091 FOLLOWING OUTPUT PROCESSING, RETURN TO THE GEN3DAP FILTERS IS MADE FOR CALCULATION OF THE REMAINING NODES
R1093 NP1 TO NP3, OR NY1 TO NY3. GEN3DAP FILTERS THEN RETURN TO THE LEM-ON CODING AT ..DELBARP,Y.. FOR RESPECTIVE
R1095 OFFSET-TRACKER-FILTER COMPUTATIONS AND COPYCYCLES. NOTE THE EQUIVALENCES...NP1TMP=J5TMP, NP1=J5,
R1097 NP2TMP=NSUMTMP, NP2=PNSUM, NP3TMP=DSUMTMP, NP3=PDSUM, WITH CORRESPONDING RELATIONS FOR YAW. THUS THE COPY-
R1099 CYCLE PCOPY, FROM THE GEN3DAP STANDPOINT, IS EFFECTIVE FROM PMISC-3 TO ITS END AT TC Q. YCOPY FROM YMISC-3.

R1101 SCALING OF THE FILTER NODES, COEFFICIENTS, AND GAINS WITHIN THE AGC IS AS FOLLOWS.....

	QUANTITY	QUANTITY	PHYS.UNITS	MAX.VALUE	SCALE AT (FOR)	
R1103						
R1105	EP	EY	REVS	1/8	B-1 REV	(COU SCALING)
R1107	NPO	NYO	REVS	(B+1)	B+1 REV	
R1109	NP1	NY1	REVS	(B+3)	B+3 REV	
R1111	NP2	NY2	REVS	(B+3)	B+3 REV	
R1113	NP3	NY3	REVS	(B+3)	B+3 REV	
R1115	NPD	NYD	ASC REVS	(1)	1 ASCREV	(ACTUATOR COU SCALING)
R1117	KPGEN3	KYGEN3	ASCREV/REV	(8)	B+3 ASCREV/REV	
R1119	APO	AYO	DIMLESS.	1	B+2	
R1121	AP1	AY1	DIMLESS.	6	B+4	
R1123	AP2	AY2	DIMLESS.	12	B+4	
R1125	AP3	AY3	DIMLESS.	8	B+4	
R1127	BP1	BY1	DIMLESS.	3	B+2	
R1129	BP2	BY2	DIMLESS.	3	B+2	
R1131	BP3	BY3	DIMLESS.	1	B+2	

R1132 FILTER COEFFICIENTS, GAINS, AND NODES ARE HELD IN DOUBLE PRECISION (ERASABLE) TO PERMIT CONSERVATIVE
R1134 SCALING AND YET OFFSET TRUNCATION LOSSES. THIS APPEARS NECESSARY IF FILTER FLEXIBILITY IS TO BE MAINTAINED.
R1136 COMPUTATION TIME IS NOT CRITICAL.

R1138 CALLING SEQUENCE....

R1139 *TC POSTJUMP....
R1140 CADR NPONCDE, NP1, NY0, NY1. SPECIFICALLY, FROM PITCHDAP OR YAWDAP
R1141 (TVCDAP),AT P1FILJMP, P2FILJMP, Y1FILJMP, Y2FILJMP

R1142 NORMAL EXIT MODE....

R1143 *TC POSTJUMP....
R1144 CADR (POFFSET, DELBARP), (YOFFSET, DELBARY). IE, RETURNS TO
R1145 PITCHDAP OR YAWDAP AT APPROPRIATE ENTRY POINT

R1146 ALARM OR ABORT EXIT MODES....NONE

R1147 SUBROUTINES CALLED.... NONE

R1148 ERASABLE INITIALIZATION REQUIRED....

R1149 *AP0(SP),AP1(DP),...AP3(DP), (PITCH AND YAW) NUMERATOR COEFFICIENTS
R1150 (PAD LOADS)
R1151 *BP1(DP)....BP3(DP), (PITCH AND YAW) DENOMINATOR COEFFICIENTS
R1152 (PAD LOADS)
R1153 *KPGEN3 (S40.15 OF R03)

R1154 OUTPUT....

R1155 *CNDTMP (NPD, NYD) FOR OUTPUT PROCESSING BY PITCHDAP OR YAWDAP
R1156 *OTHER FILTER MODES

R1157 DEBRIS....TVC TEMPORARIES, SHAREABLE WITH RCS/ENTRY IN EBANK6 ONLY

```
1158                        21,2026          BANK   21
1159  REF   1               17,2000          SETLOC DAPS4
1160                        17,2215          BANK
1161  REF   1               E6,1742          EBANK= EP
1162  REF   1                                COUNT* $$/GEN3
```

P1163 PITCH GEN3CAP FILTER.....

```
1164                        17,2215  0 0006 1  NPONODE  EXTEND          FORM NODE NPO....COLLECT  (PAST NP1)
1165  REF   1               17,2216  3 1564 1           DCA    NP1          (COMES HERE FROM REG. DAP CODING)
1166                        17,2217  20 001 1           DDOUBL
1167                        17,2220  20 001 1           DDOUBL
1168  REF   1               17,2221  53'562 C           DXCH   NPO

1169  REF   2 LAST  960     17,2222  31'742 1  APO(EP)  CAE    EP           SPXSP MULTIPLY FOR NUMERATOR COMPONENT
1170                        17,2223  0 0006 1           EXTEND                  EP = ERRBTMP,  SP, SC.AT B-1 REVS
1171  REF   2 LAST   98     17,2224  7 1427 C           MP     APO
1172  REF   2 LAST  961     17,2225  21'562 C           DAS    NPO          COMPLETED NODE NPO, SC.AT B+1 REVS


1173  REF   3 LAST  961     17,2226  31'561 1  NPONODE  CAE    NPO          FORM NODE NPO....SPXDP MULTIPLY BY GAIN
1174                        17,2227  0 0006 1           EXTEND
1175  REF   2 LAST  103     17,2230  7 1651 C           MP     KPGEN3
1176  REF   1               17,2231  53'745 1           DXCH   NPD
1177  REF   4 LAST  961     17,2232  31'562 1           CAE    NPO +1
1178                        17,2233  0 0006 1           EXTEND
1179  REF   3 LAST  961     17,2234  7 1651 C           MP     KPGEN3
1180                        17,2235  22 007 C           ZL
1181  REF 216 LAST  953     17,2236  22 000 1           LXCH   A
1182  REF   2 LAST  961     17,2237  21'745 1           DAS    NPD          SC.AT B+4 ASCREV SINCE KPGEN3 AT B+3

1183  REF   3 LAST  961     17,2240  53'745 1           DXCH   NPD          FIX UP SCALING
1184                        17,2241  20 001 1           DDOUBL
1185                        17,2242  20 001 1           DDOUBL
1186                        17,2243  20 001 1           DDOUBL
1187                        17,2244  20 001 1           DDOUBL
1188  REF   4 LAST  961     17,2245  53'745 1           DXCH   NPD          COMPLETED NODE NPD, SC.AT 1ASCREV


1189  REF  54 LAST  929     17,2246  0 4574 C           TC     POSTJUMP     TRANSFER BACK TO REGULAR DAP CODING FOR
1190  REF   1               17,2247   40436 1          CADR   POFFSET            OUTPUT  (NPD = CMDTMP, DP)
1191                        17,2250  0 0006 1  NP1NODE  EXTEND              FORM NODE NP1....COLLECT  (PAST NP2)
1192  REF   1               17,2251  3 1542 C           DCA    NP2              (COMES HERE FROM REG. DAP CODING)
1193  REF   1               17,2252  53'737 1           DXCH   NP1TMP

1194  REF   5 LAST  961     17,2253  4 1561 C  BP1(NPO) CS     NPO          DPXDP MULTIPLY FOR DENOMINATOR COMPONENT
1195                        17,2254  0 0006 1           EXTEND
1196  REF   2 LAST   98     17,2255  7 1436 C           MP     BP1
1197  REF   2 LAST  961     17,2256  21'737 1           DAS    NP1TMP
1198  REF   6 LAST  961     17,2257  4 1562 C           CS     NPO +1
1199                        17,2260  0 0006 1           EXTEND
1200  REF   3 LAST  961     17,2261  7 1436 C           MP     BP1
1201  REF   3 LAST  961     17,2262  27'737 1           ADS    NP1TMP +1
1202  REF 104 LAST  952     17,2263  54 001 1           TS     L
1203                        17,2264  1 2266 C           TCF    +2
1204  REF   4 LAST  961     17,2265  27'736 C           ADS    NP1TMP
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1205  REF   7  LAST  961   17,2266  4 1561 C          CS     NPO
1206                       17,2267  0 0006 1          EXTEND
1207  REF   4  LAST  961   17,2270  7 1437 1          MP     BP1 +1
1208  REF   5  LAST  961   17,2271  27'737 1          ADS    NP1TMP +1
1209  REF 1C5  LAST  961   17,2272  54 001 1          TS     L
1210                       17,2273  1 2275 1          TCF    +2
1211  REF   6  LAST  962   17,2274  27'736 C          ADS    NP1TMP

1212  REF   3  LAST  961   17,2275  31'742 1 AP1(EP)  CAE    EP          DPXSP MULTIPLY FOR NUMERATOR COMPONENT
1213                       17,2276  0 0006 1          EXTEND
1214  REF   2  LAST   98   17,2277  7 1430 C          MP     AP1
1215  REF   7  LAST  962   17,2300  21'737 1          DAS    NP1TMP
1216  REF   4  LAST  962   17,2301  31'742 1          CAE    EP
1217                       17,2302  0 0006 1          EXTEND
1218  REF   3  LAST  962   17,2303  7 1431 1          MP     AP1 +1
1219  REF   8  LAST  962   17,2304  27'737 1          ADS    NP1TMP +1
1220  REF 1C6  LAST  962   17,2305  54 001 1          TS     L
1221                       17,2306  1 2310 C          TCF    +2
1222  REF   9  LAST  962   17,2307  27'736 C          ADS    NP1TMP      COMPLETED NODE NP1

1223                       17,2310  0 0006 1 NP2NODE  EXTEND             FORM NODE NP2....COLLECT (PAST NP3)
1224  REF   1                17,2311  3 1544 C          DCA    NP3
1225  REF   1                17,2312  53'712 C          DXCH   NP2TMP
1226  REF   8  LAST  962   17,2313  4 1561 C BP2(NPO) CS     NPO         DPXDP MULTIPLY FOR DENOMINATOR COMPONENT
1227                       17,2314  0 0006 1          EXTEND
1228  REF   2  LAST   99   17,2315  7 1440 1          MP     BP2
1229  REF   2  LAST  962   17,2316  21'712 C          DAS    NP2TMP
1230  REF   9  LAST  962   17,2317  4 1562 C          CS     NPO +1
1231                       17,2320  0 0006 1          EXTEND
1232  REF   3  LAST  962   17,2321  7 1440 1          MP     BP2
1233  REF   3  LAST  962   17,2322  27'712 C          ADS    NP2TMP +1
1234  REF 1C7  LAST  962   17,2323  54 001 1          TS     L
1235                       17,2324  1 2326 C          TCF    +2
1236  REF   4  LAST  962   17,2325  27'711 C          ADS    NP2TMP
1237  REF  10  LAST  962   17,2326  4 1561 C          CS     NPO
1238                       17,2327  0 0006 1          EXTEND
1239  REF   4  LAST  962   17,2330  7 1441 C          MP     BP2 +1
1240  REF   5  LAST  962   17,2331  27'712 C          ADS    NP2TMP +1
1241  REF 1C8  LAST  962   17,2332  54 001 1          TS     L
1242                       17,2333  1 2335 1          TCF    +2
1243  REF   6  LAST  962   17,2334  27'711 C          ADS    NP2TMP

1244  REF   5  LAST  962   17,2335  31'742 1 AP2(EP)  CAE    EP          DPXSP MULTIPLY FOR NUMERATOR COMPONENT
1245                       17,2336  0 0006 1          EXTEND
1246  REF   2  LAST   98   17,2337  7 1432 1          MP     AP2
1247  REF   7  LAST  962   17,2340  21'712 C          DAS    NP2TMP
1248  REF   6  LAST  962   17,2341  31'742 1          CAE    EP
1249                       17,2342  0 0006 1          EXTEND
1250  REF   3  LAST  962   17,2343  7 1433 C          MP     AP2 +1
1251  REF   8  LAST  962   17,2344  27'712 C          ADS    NP2TMP +1
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1252  REF 109 LAST 962  17,2345  54 001 1          TS    L
1253                    17,2346  1 2350 1          TCF   +2
1254  REF   9 LAST 962  17,2347  27'711 C          ADS   NP2TMP        COMPLETED NODE NP2

1255  REF  11 LAST 962  17,2350  4 1561 C NP3NODE  CS    NPO           FORM NODE NP3....NO PAST NODES, DIRECT
1256                    17,2351  0 0006 1          EXTEND                    TO DPXCP MULTIPLY FOR DENOMINATOR
1257  REF   2 LAST  99  17,2352  7 1442 C          MP    BP3                 COMPONENT
1258  REF   1           17,2353  53'714 C          DXCH  NP3TMP
1259  REF  12 LAST 963  17,2354  4 1562 C          CS    NPO +1
1260                    17,2355  0 0006 1          EXTEND
1261  REF   3 LAST 963  17,2356  7 1442 C          MP    BP3
1262  REF   2 LAST 963  17,2357  27'714 C          ADS   NP3TMP +1
1263  REF 110 LAST 963  17,2360  54 001 1          TS    L
1264                    17,2361  1 2363 1          TCF   +2
1265  REF   3 LAST 963  17,2362  27'713 1          ADS   NP3TMP
1266  REF  13 LAST 963  17,2363  4 1561 C          CS    NPO
1267                    17,2364  0 0006 1          EXTEND
1268  REF   4 LAST 963  17,2365  7 1443 1          MP    BP3 +1
1269  REF   4 LAST 963  17,2366  27'714 C          ADS   NP3TMP +1
1270  REF 111 LAST 963  17,2367  54 001 1          TS    L
1271                    17,2370  1 2372 1          TCF   +2
1272  REF   5 LAST 963  17,2371  27'713 1          ADS   NP3TMP

1273  REF   7 LAST 962  17,2372  31'742 1 AP3(EP)  CAE   EP            DPXSP MULTIPLY FOR NUMERATOR COMPONENT
1274                    17,2373  0 0006 1          EXTEND
1275  REF   2 LAST  98  17,2374  7 1434 1          MP    AP3
1276  REF   6 LAST 963  17,2375  21'714 C          DAS   NP3TMP
1277  REF   8 LAST 963  17,2376  31'742 1          CAE   EP
1278                    17,2377  0 0006 1          EXTEND
1279  REF   3 LAST 963  17,2400  7 1435 C          MP    AP3 +1
1280  REF   7 LAST 963  17,2401  27'714 C          ADS   NP3TMP +1
1281  REF 112 LAST 963  17,2402  54 001 1          TS    L
1282                    17,2403  1 2405 C          TCF   +2
1283  REF   8 LAST 963  17,2404  27'713 1          ADS   NP3TMP        COMPLETED NODE NP3, AND PITCH GEN3DAP
A1284                                                                       FILTER COMPUTATIONS

1285  REF  55 LAST 961  17,2405  0 4574 C          TC    POSTJUMP      RETURN TO CSMDAP CODING FOR PITCH
1286  REF   1           17,2406   40523 1          CADR  DELBARP             OFFSET-TRACKER-FILTER COMPUTATIONS,
A1287                                                                       AND PITCH DAP COPYCYCLE.
```

P1288 YAW GEN3CAP FILTER....

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1289                        17,2407  0 0006 1  NYONODE  EXTEND          FORM NODE NYO....COLLECT  (PAST NY1)
1290  REF   1               17,2410  3 1610 1           DCA    NY1           (COMES HERE FROM REG. DAP CODING)
1291                        17,2411  2C 001 1           DDOUBL
1292                        17,2412  2C 001 1           DDOUBL
1293  REF   1               17,2413  53'606 1           DXCH   NYO

1294  REF   1               17,2414  31'742 1  AYO(EY)   CAE    EY            SPXSP MULTIPLY FOR NUMERATOR COMPONENT
1295                        17,2415  0 0006 1           EXTEND                   EY = ERRBTMP,  SP, SC.AT B-1 REVS
1296  REF   1               17,2416  7 1427 C           MP     AYO
1297  REF   2  LAST  964    17,2417  21'606 1           DAS    NYO           COMPLETED NODE NYO, SC.AT B+1 REVS


1298  REF   3  LAST  964    17,2420  31'605 C  NYDNODE   CAE    NYO           FORM NODE NYD....SPXDP MULTIPLY BY GAIN
1299                        17,2421  0 0006 1           EXTEND
1300  REF   1               17,2422  7 1651 C           MP     KYGEN3
1301  REF   1               17,2423  53'745 1           DXCH   NYD
1302  REF   4  LAST  964    17,2424  31'606 C           CAE    NYO +1
1303                        17,2425  0 0006 1           EXTEND
1304  REF   2  LAST  964    17,2426  7 1651 C           MP     KYGEN3
1305                        17,2427  22 007 C           ZL
1306  REF 217  LAST  961    17,2430  22 000 1           LXCH   A
1307  REF   2  LAST  964    17,2431  21'745 1           DAS    NYD           SC.AT B+4 ASCREV SINCE KYGEN3 AT B+1

1308  REF   3  LAST  964    17,2432  53'745 1           DXCH   NYD           FIX UP SCALING
1309                        17,2433  20 001 1           DDOUBL
1310                        17,2434  2C 001 1           DDOUBL
1311                        17,2435  2C 001 1           DDOUBL
1312                        17,2436  20 001 1           DDOUBL
1313  REF   4  LAST  964    17,2437  53'745 1           DXCH   NYD           COMPLETED NODE NYD, SC.AT 1ASCREV


1314  REF  56  LAST  963    17,2440  0 4574 C           TC     POSTJUMP      TRANSFER BACK TC REGULAR DAP CODING FOR
1315  REF   1               17,2441   40714 1          CADR   YOFFSET           OUTPUT  (NYD = CMDTMP, DP)
1316                        17,2442  0 0006 1  NY1NODE   EXTEND          FORM NODE NY1....COLLECT  (PAST NY2)
1317  REF   1               17,2443  3 1566 C           DCA    NY2           (COMES HERE FROM REG. DAP CODING)
1318  REF   1               17,2444  53'737 1           DXCH   NY1TMP

1319  REF   5  LAST  964    17,2445  4 1605 1  BY1(NYO)  CS     NYO           DPXDP MULTIPLY FOR DENOMINATOR COMPONENT
1320                        17,2446  0 0006 1           EXTEND
1321  REF   1               17,2447  7 1436 C           MP     BY1
1322  REF   2  LAST  964    17,2450  21'737 1           DAS    NY1TMP
1323  REF   6  LAST  964    17,2451  4 1606 1           CS     NYO +1
1324                        17,2452  0 0006 1           EXTEND
1325  REF   2  LAST  964    17,2453  7 1436 C           MP     BY1
1326  REF   3  LAST  964    17,2454  27'737 1           ADS    NY1TMP +1
1327  REF 113  LAST  963    17,2455  54 001 1           TS     L
1328                        17,2456  1 2460 C           TCF    +2
1329  REF   4  LAST  964    17,2457  27'736 C           ADS    NY1TMP
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```
1330  REF   7  LAST  964   17,2460  4 1605 1          CS      NY0
1331                       17,2461  0 0006 1          EXTEND
1332  REF   3  LAST  964   17,2462  7 1437 1          MP      BY1 +1
1333  REF   5  LAST  964   17,2463  27'737 1          ADS     NY1TMP +1
1334  REF 114  LAST  964   17,2464  54 001 1          TS      L
1335                       17,2465  1 2467 1          TCF     +2
1336  REF   6  LAST  965   17,2466  27'736 0          ADS     NY1TMP

1337  REF   2  LAST  964   17,2467  31'742 1 AY1(EY)  CAE     EY      DPXSP MULTIPLY FOR NUMERATOR COMPONENT
1338                       17,2470  0 0006 1          EXTEND
1339  REF   1              17,2471  7 1430 0          MP      AY1
1340  REF   7  LAST  965   17,2472  21'737 1          DAS     NY1TMP
1341  REF   3  LAST  965   17,2473  31'742 1          CAE     EY
1342                       17,2474  0 0006 1          EXTEND
1343  REF   2  LAST  965   17,2475  7 1431 1          MP      AY1 +1
1344  REF   8  LAST  965   17,2476  27'737 1          ADS     NY1TMP +1
1345  REF 115  LAST  965   17,2477  54 001 1          TS      L
1346                       17,2500  1 2502 0          TCF     +2
1347  REF   9  LAST  965   17,2501  27'736 0          ADS     NY1TMP  COMPLETED NODE NY1

1348                       17,2502  0 0006 1 NY2NODE  EXTEND          FORM NODE NY2....COLLECT (PAST NY3)
1349  REF   1              17,2503  3 1570 1          DCA     NY3
1350  REF   1              17,2504  53'712 0          DXCH    NY2TMP

1351  REF   8  LAST  965   17,2505  4 1605 1 BY2(NY0) CS      NY0     DPXDP MULTIPLY FOR DENOMINATOR COMPONENT
1352                       17,2506  0 0006 1          EXTEND
1353  REF   1              17,2507  7 1440 1          MP      BY2
1354  REF   2  LAST  965   17,2510  21'712 0          DAS     NY2TMP
1355  REF   9  LAST  965   17,2511  4 1606 1          CS      NY0 +1
1356                       17,2512  0 0006 1          EXTEND
1357  REF   2  LAST  965   17,2513  7 1440 1          MP      BY2
1358  REF   3  LAST  965   17,2514  27'712 0          ADS     NY2TMP +1
1359  REF 116  LAST  965   17,2515  54 001 1          TS      L
1360                       17,2516  1 2520 0          TCF     +2
1361  REF   4  LAST  965   17,2517  27'711 0          ADS     NY2TMP
1362  REF  10  LAST  965   17,2520  4 1605 1          CS      NY0
1363                       17,2521  0 0006 1          EXTEND
1364  REF   3  LAST  965   17,2522  7 1441 0          MP      BY2 +1
1365  REF   5  LAST  965   17,2523  27'712 0          ADS     NY2TMP +1
1366  REF 117  LAST  965   17,2524  54 001 1          TS      L
1367                       17,2525  1 2527 1          TCF     +2
1368  REF   6  LAST  965   17,2526  27'711 0          ADS     NY2TMP

1369  REF   4  LAST  965   17,2527  31'742 1 AY2(EY)  CAE     EY      DPXSP MULTIPLY FOR NUMERATOR COMPONENT
1370                       17,2530  0 0006 1          EXTEND
1371  REF   1              17,2531  7 1432 1          MP      AY2
1372  REF   7  LAST  965   17,2532  21'712 0          DAS     NY2TMP
1373  REF   5  LAST  965   17,2533  31'742 1          CAE     EY
1374                       17,2534  0 0006 1          EXTEND
1375  REF   2  LAST  965   17,2535  7 1433 0          MP      AY2 +1
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1376  REF   8  LAST  965   17,2536  27'712 C          ADS    NY2TMP +1
1377  REF 118  LAST  965   17,2537  54 001 1          TS     L
1378                       17,2540  1 2542 1          TCF    +2
1379  REF   9  LAST  966   17,2541  27'711 C          ADS    NY2TMP          COMPLETED NODE NY2

1380  REF  11  LAST  965   17,2542  4 1605 1 NY3NODE  CS     NYO             FORM NODE NY3....NO PAST NODES, DIRECT
1381                       17,2543  0 0006 1          EXTEND                      TO DPXDP MULTIPLY FOR DENOMINATOR
1382  REF   1              17,2544  7 1442 C          MP     BY3                  COMPONENT
1383  REF   1              17,2545  53'714 C          DXCH   NY3TMP
1384  REF  12  LAST  966   17,2546  4 1606 1          CS     NYO +1
1385                       17,2547  0 0006 1          EXTEND
1386  REF   2  LAST  966   17,2550  7 1442 C          MP     BY3
1387  REF   2  LAST  966   17,2551  27'714 C          ADS    NY3TMP +1
1388  REF 119  LAST  966   17,2552  54 001 1          TS     L
1389                       17,2553  1 2555 1          TCF    +2
1390  REF   3  LAST  966   17,2554  27'713 1          ADS    NY3TMP
1391  REF  13  LAST  966   17,2555  4 1605 1          CS     NYO
1392                       17,2556  0 0006 1          EXTEND
1393  REF   3  LAST  966   17,2557  7 1443 1          MP     BY3 +1
1394  REF   4  LAST  966   17,2560  27'714 C          ADS    NY3TMP +1
1395  REF 120  LAST  966   17,2561  54 001 1          TS     L
1396                       17,2562  1 2564 C          TCF    +2
1397  REF   5  LAST  966   17,2563  27'713 1          ADS    NY3TMP

1398  REF   6  LAST  965   17,2564  31'742 1 AY3(EY)  CAE    EY              DPXSP MULTIPLY FOR NUMERATOR COMPONENT
1399                       17,2565  0 0006 1          EXTEND
1400  REF   1              17,2566  7 1434 1          MP     AY3
1401  REF   6  LAST  966   17,2567  21'714 C          DAS    NY3TMP
1402  REF   7  LAST  966   17,2570  31'742 1          CAE    EY
1403                       17,2571  0 0006 1          EXTEND
1404  REF   2  LAST  966   17,2572  7 1435 C          MP     AY3 +1
1405  REF   7  LAST  966   17,2573  27'714 C          ADS    NY3TMP +1
1406  REF 121  LAST  966   17,2574  54 001 1          TS     L
1407                       17,2575  1 2577 1          TCF    +2
1408  REF   8  LAST  966   17,2576  27'713 1          ADS    NY3TMP          COMPLETED NODE NY3, AND YAW GEN3DAP
A1409                                                                           FILTER COMPUTATIONS

1410  REF  57  LAST  964   17,2577  0 4574 C          TC     POSTJUMP        RETURN TO CSMDAP CODING FOR YAW
1411  REF   1              17,2600   41001 C          CADR   DELBARY             OFFSET-TRACKER-FILTER COMPUTATIONS,
A1412                                                                           AND YAW DAP COPYCYCLE.
```

```
0001                          20,3550                    BANK   20
0002   REF   1                21,2000                    SETLOC MYSUBS
0003                          21,2026                    BANK

0004   REF   3  LAST  201     E6,1510                    EBANK= KMPAC
0005   REF   1                  4767          SPCOS1     EQUALS SPCOS
0006   REF   1                  4770          SPSIN1     EQUALS SPSIN
0007   REF   2  LAST  967      4767          SPCOS2     EQUALS SPCOS
0008   REF   2  LAST  967      4770          SPSIN2     EQUALS SPSIN


0009   REF   1                                          COUNT  21/DAPMS

R0010  ONE AND ONE HALF PRECISION MULTIPLICATION ROUTINE

0011   REF   2  LAST  105     21,2026  55'512 1  SMALLMP  TS     KMPTEMP      A(X+Y)
0012                          21,2027  0 0006 1           EXTEND
0013   REF   4  LAST  967     21,2030  7 1511 1           MP     KMPAC +1
0014   REF   5  LAST  967     21,2031  55'511 1           TS     KMPAC +1     AY
0015   REF 169  LAST  956     21,2032  3 4714 1           CAF    ZERO
0016   REF   6  LAST  967     21,2033  57'510 1           XCH    KMPAC
0017                          21,2034  0 0006 1           EXTEND
0018   REF   3  LAST  967     21,2035  7 1512 1           MP     KMPTEMP      AX
0019   REF   7  LAST  967     21,2036  21'511 1           DAS    KMPAC        AX+AY
0020   REF 188  LAST  942     21,2037  0 0002 0           TC     Q

R0021  SUBROUTINE FOR DOUBLE PRECISION ADDITIONS OF ANGLES
R0022  A AND L CONTAIN A DP(1S) ANGLE SCALED BY 180 DEGS TO BE ADDED TO KMPAC.
R0023  RESULT IS PLACED IN KMPAC.  TIMING = 6 MCT (22 MCT ON OVERFLOW)

0024   REF   8  LAST  967     21,2040  21'511 1  DPADD    DAS    KMPAC
0025                          21,2041  0 0006 1           EXTEND
0026   REF   1                21,2042  1 2057 0           BZF    TSK +1       NO OVERFLOW
0027   REF   9  LAST  967     21,2043  11'510 0           CCS    KMPAC
0028   REF   1                21,2044  1 2060 1           TCF    DPADD+       + OVERFLOW
0029                          21,2045  1 2047 1           TCF    +2
0030   REF   1                21,2046  1 2062 0           TCF    DPADD-       - OVERFLOW
0031   REF  10  LAST  967     21,2047  11'511 1           CCS    KMPAC +1
0032   REF   1                21,2050  1 2065 1           TCF    DPADD2+      UPPER = 0, LOWER +
0033                          21,2051  1 2053 1           TCF    +2
0034                          21,2052  4 0000 0           COM                 UPPER = 0, LOWER -
0035   REF  22  LAST  953     21,2053  6 4672 0           AD     POSMAX       LOWER = 0, A=0
0036   REF  11  LAST  967     21,2054  55'511 1           TS     KMPAC +1     CAN NOT OVERFLOW
0037   REF  23  LAST  967     21,2055  3 4672 0           CA     POSMAX       UPPER WAS = 0
0038   REF  12  LAST  967     21,2056  55'510 0  TSK      TS     KMPAC
0039   REF 189  LAST  967     21,2057  0 0002 0           TC     Q

0040   REF   5  LAST  954     21,2060  6 4674 0  DPADD+   AD     NEGMAX       KMPAC GREATER THAN 0
0041   REF   2  LAST  967     21,2061  1 2056 1           TCF    TSK
```

```
0042                          21,2062  4 0000 0  DPADD-   COM
0043   REF  24  LAST  967     21,2063  6 4672 0           AD      POSMAX          KMPAC LESS THAN 0
0044   REF   3  LAST  967     21,2064  1 2056 1           TCF     TSK

0045   REF   6  LAST  967     21,2065  6 4674 0  DPADD2+  AD      NEGMAX          CAN NOT OVERFLOW
0046   REF  13  LAST  967     21,2066  55'511 1           TS      KMPAC +1
0047   REF   7  LAST  968     21,2067  3 4674 0           CA      NEGMAX          UPPER WAS = 0
0048   REF   4  LAST  968     21,2070  1 2056 1           TCF     TSK
```

L MYSLBS USER'S PAGE NO. 3 E6 S3

L RCS-CSM DIGITAL AUTOPILOT USER'S PAGE NO. 1 E0 S3

```
P0001   T5 INTERRUPT PROGRAM FOR THE RCS-CSM AUTOPILOT
R0002         START OF T5 INTERRUPT PROGRAM


0003                              20,3550                    BANK    20
0004   REF   2  LAST  688        21,2000                    SETLOC  DAPS3
0005                              21,2071                    BANK

0006   REF   1                                               COUNT   21/DAPRC

0007   REF  14  LAST  968        E6,1510                    EBANK=  KMPAC
0008   REF  16  LAST  956        21,2071   22 016 C  REDORCS LXCH    BANKRUPT      RESTART OF AUTOPILOT COMES HERE
0009   REF   2  LAST  689        21,2072   3 1465 1         CA      T5PHASE       ON A T5 RUPT.
0010                              21,2073   0 0006 1         EXTEND
00101                             21,2074   6 2076 1         BZMF    +2            IF T5PHASE +0, -0, OR -, RESET TO -
00102                             21,2075   1 2100 C         TCF     +3            IF T5PHASE +, LEAVE IT +.  DO A FRESHDAP
00103  REF 102  LAST  953         21,2076   4 4712 C         CS      ONE
00104  REF   3  LAST  970        21,2077   55'465 C         TS      T5PHASE
0011                              21,2100   0 0006 1         EXTEND
0012   REF   1                   21,2101   3 2105 1         DCA     RCSLOC
0013   REF  19  LAST  933        21,2102   53'313 C         DXCH    T5LOC         HOOK UP T5RUPT TO AUTOPILOT
0014   REF   3  LAST  689        21,2103   1 2107 1         TCF     RCSATT +1
0015   REF  15  LAST  970        E6,1510                    EBANK=  KMPAC
0016   REF   4  LAST  970        21,2104    02106 1 RCSLOC  2CADR   RCSATT
                                  21,2105    42066 1


0017   REF  17  LAST  970        21,2106   22 016 C  RCSATT  LXCH    BANKRUPT      SAVE BB
0018                              21,2107   0 0006 1         EXTEND                SAVE Q
0019   REF  13  LAST  927        21,2110   22 012 1         QXCH    QRUPT
0020   REF  40  LAST  955        21,2111   3 4674 C         CAF     BIT15         BIT15 CHAN31 = 0 IF IMU POWER IS ON AND
0021                              21,2112   0 0006 1         EXTEND                S/C CONT SW IS IN CMC (I.E. IF G/C AUTO
0022   REF   5  LAST  679        21,2113   02 031 1         RAND    CHAN31        PILOT IS FULLY ENABLED)
0023                              21,2114   0 0006 1         EXTEND
0024   REF   1                   21,2115   1 2144 C         BZF     SETT5         IF G/C AUTOPILOT IS FULLY ENABLED,
A0025                                                                            GO TO SETT5


0026   REF  14  LAST  898        21,2116   4 1501 C         CS      RCSFLAGS      IF G/C AUTOPILOT IS NOT FULLY ENABLED,
0027   REF  91  LAST  950        21,2117   7 4675 C         MASK    BIT14
0028   REF  15  LAST  970        21,2120   27'501 C         ADS     RCSFLAGS      SET NORATE FLAG,
0029   REF  25  LAST  968        21,2121   3 4672 C         CAF     POSMAX
0030   REF   7  LAST  687        21,2122   55'332 C         TS      HOLDFLAG      SET HOLDFLAG +,
00301  REF 170  LAST  967        21,2123   3 4714 1         CAF     ZERO          ZERO ERRORX, ERRORY, AND ERRORZ,
00302  REF   5  LAST  172        21,2124   55'567 C         TS      ERRORX
00303  REF   3  LAST  110        21,2125   55'570 C         TS      ERRORY
00304  REF   2  LAST  106        21,2126   55'571 1         TS      ERRORZ
0031   REF  52  LAST  970        21,2127   3 4675 1         CAF     BIT14
0032                              21,2130   0 0006 1         EXTEND
0033   REF   6  LAST  970        21,2131   02 031 1         RAND    CHAN31        AND CHECK FREE FUNCTION (BIT14 CHAN31).
00339                             21,2132   0 0006 1         EXTEND
```

```
00331  REF   2  LAST  970   21,2133  1 2144 C          BZF     SETT5          IF IN FREE MODE, GO TO SETT5.

00332  REF   4  LAST  970   21,2134  55'465 C          TS      T5PHASE        IF NOT IN FREE MODE,
00333  REF   1               21,2135  3 7676 1          CAF     OCT37766       SCHEDULE REINITIALIZATION (FRESHDAP)
00334  REF  15  LAST  933   21,2136  54 030 C          TS      TIME5          IN 100 MS VIA T5RUPT

00335  REF   3  LAST  687   21,2137  0 2616 1          TCR     ZEROJET        ZERO JET CHANNELS IN 14 MS VIA ZEROJET

0034   REF   1               21,2140  1 2334 C          TCF     KMATRIX
0035                         21,2141   37770 C  DELTATT  OCT     37770          80MS (TIME5)
0036                         21,2142   37776 C  DELTATT2 OCT     37776          20MS (TIME5)
0037                         21,2143  37634 1   ONESEK   DEC     16284          1 SEC(TIME5)
0038                    0005           CHAN5    EQUALS 5
0039                    0006           CHAN6    EQUALS 6
0043   REF   4  LAST  226      7671           PRIO34A  =       PRIO34
R0044          CHECK PHASE OF T5 PROGRAM

R0045      BECAUSE OF THE LENGTH OF THE T5 PROGRAM, IT HAS BEEN DIVIDED INTO
R0046  THREE PARTS, T5PHASE1, T5PHASE2, AND THE JET SELECTION LOGIC,
R0047  TO ALLOW FOR THE EXECUTION OF OTHER
R0048  INTERRUPTS.  T5PHASE IS ALSO USED IN THE INITIALIZATION OF THE AUTOPILOT
R0049  VARIABLES AT TURN ON.
R0050  THE CODING OF T5PHASE IS...

R0051           + = INITIALIZE T5 RCS-CSM AUTOPILOT
R0052  T5PHASE = 40 = PHASE2 OF THE T5 PROGRAM
R0053           -  = RESTART DAP
R0054           -0 = PHASE1 OF THE T5 PROGRAM

0055   REF   5  LAST  971   21,2144  11'465 C  SETT5    CCS     T5PHASE
0056   REF   1               21,2145  1 2530 1          TCF     FRESHDAP       TURN ON AUTOPILOT
0057   REF   1               21,2146  1 2645 C          TCF     T5PHASE2       BRANCH TO PHASE2 OF PROGRAM
0058   REF   1               21,2147  1 2532 C          TCF     REDAP          RESTART AUTOPILOT


0059   REF   6  LAST  971   21,2150  55'465 C          TS      T5PHASE        PHASE 1  RESET  FOR PHASE 2
0060   REF  16  LAST  971   21,2151  3 0030 1          CA      TIME5
0061   REF   2  LAST  106   21,2152  55'634 C          TS      T5TIME         USED IN COMPENSATING FOR DELAYS IN T5
0062   REF   1               21,2153  3 2142 1          CAF     DELTATT2       RESET FOR T5RUPT IN 20MS FOR PHASE2
0063   REF  17  LAST  971   21,2154  54 030 C          TS      TIME5          OF PROGRAM
```

P0064 IMU STATUS CHECK

```
 0065  REF  26  LAST  379   21,2155  4 1321 1            CS     IMODES33   CHECK IMU STATUS
 0066  REF  37  LAST  774   21,2156  7 4705 0            MASK   BIT6       BIT6 = 0  IMU OK
 0067  REF 218  LAST  964   21,2157  10 000 0            CCS    A          BIT6 = 1 NO IMU
 0068  REF   1              21,2160  1 2174 0            TCF    RATEFILT
 0069  REF  16  LAST  970   21,2161  4 1501 0  FREECHK   CS     RCSFLAGS   BIT14 INDICATES THAT RATES HAVE NOT BEEN
 0070  REF  53  LAST  970   21,2162  7 4675 0            MASK   BIT14      INITIALIZED
 0071  REF  17  LAST  972   21,2163  27'501 0            ADS    RCSFLAGS
 0072  REF  54  LAST  972   21,2164  3 4675 1            CAF    BIT14      NO ATTITUDE REFERENCE
 0073  REF   8  LAST  970   21,2165  55'332 0            TS     HOLDFLAG   STOP ANY AUTOMATIC STEERING AND PREPARE
A0074                                                                     TO PICK UP CDU ANGLES UPON RESUMPTION OF
A0075                                                                     ATTITUDE HOLD
 0076                       21,2166  0 0006 1            EXTEND
 0077  REF   7  LAST  970   21,2167  02 031 1            RAND   CHAN31     CHECK FOR FREE MODE
 0078                       21,2170  0 0006 1            EXTEND
 0079  REF   1              21,2171  1 2403 0            BZF    KRESUME1   IN FREE MODE PROVIDE FREE CONTROL ONLY
 0080  REF   1              21,2172  1 2520 0            TCF    REINIT     .....TILT.....................
 0081                       21,2173   00030 1  BITS4,5   OCT    30

 0082  REF  18  LAST  972   21,2174  3 1501 1  RATEFILT  CA     RCSFLAGS   SEE IF RATEFILTER HAS BEEN INITIALIZED
 0083  REF  55  LAST  972   21,2175  7 4675 0            MASK   BIT14
 0084                       21,2176  0 0006 1            EXTEND             IF SC, PROCEED WITH RATE DERIVATION
 0085                       21,2177  1 2201 1            BZF    +2
 0086  REF   2  LAST  971   21,2200  1 2334 0            TCF    KMATRIX          IF NOT, SKIP RATE DERIVATION

R0087            RATE FILTER     TIMING = 7.72MS

R0088  RATE FILTER EQUATIONS
R0089  DRHO = DELRHO - (.1)ADOT + (1 - GAIN1)DRHO
R0090                                          -1
R0091  ADOT = ADOT   + GAIN2 DRHO + KMJ DFT
R0092           -1
R0093       -       *     -     -
R0094  WHERE DELRHO = ANGB (CDU - CDU  )
R0095                              -1

 0096  REF  38  LAST  902   21,2201  3 4711 1            CAF    TWO
 0097  REF   3  LAST  109   21,2202  55'506 1  DRHOLOOP  TS     SPNDX
 0098                       21,2203  6 0000 1            DOUBLE
 0099  REF   2  LAST  105   21,2204  55'507 0            TS     DPNDX
 0100  REF   3  LAST  972   21,2205  51'507 1            INDEX  DPNDX
 0101  REF   2  LAST  105   21,2206  4 1552 0            CS     DRHO       DRHO SCALED 180 DEGS
 0102                       21,2207  0 0006 1            EXTEND
 0103  REF   2  LAST  106   21,2210  5 1617 0            INDEX  ATTKALMN   PICK UP DESIRED FILTER GAIN
 0104  REF   1              21,2211  7 3063 0            MP     GAIN1
 0105  REF   4  LAST  972   21,2212  51'507 1            INDEX  DPNDX
 0106  REF   3  LAST  972   21,2213  21'553 1            DAS    DRHO       (1 -.064)DRHO
 0107                       21,2214  0 0006 1            EXTEND
```

```
0108   REF   5  LAST  972   21,2215  5 1507 1    INDEX  DPNDX
0109   REF   6  LAST  167   21,2216  4 1534 C    DCS    ADOT
0110   REF  16  LAST  970   21,2217  53'511 1    DXCH   KMPAC      -(.1)ADOT
0111   REF   2  LAST  278   21,2220  3 4676 1    CA     QUARTER
0112   REF   1               21,2221  0 2026 1    TC     SMALLMP
0113   REF  17  LAST  973   21,2222  53'511 1    DXCH   KMPAC
0114   REF   6  LAST  973   21,2223  51'507 1    INDEX  DPNDX
0115   REF   4  LAST  972   21,2224  21'553 1    DAS    DRHO
0116   REF   4  LAST  972   21,2225  11'506 1    CCS    SPNDX
0117   REF   1               21,2226  1 2202 1    TCF    DRHOLOOP

0118   REF  20  LAST  901   21,2227  3 0032 C    CA     CDUX       MEASURED BODY RATES--
0119   REF   2  LAST  106   21,2230  57'635 0    XCH    RHO
0120                        21,2231  0 0006 1    EXTEND
0121   REF   3  LAST  973   21,2232  21'635 1    MSU    RHO        -      *    -    -
0122                        21,2233  4 0000 0    COM                DELRHO = AMGB (CDU - CDU )
A0123                                                                                  -1
0124                        21,2234  22 007 C    ZL
01241  REF   2  LAST  105   21,2235  53'516 C    DXCH   DELTEMPX
0125   REF  11  LAST  933   21,2236  3 0033 1    CA     CDUY
0126   REF   2  LAST  106   21,2237  57'636 0    XCH    RHO1
0127                        21,2240  0 0006 1    EXTEND
0128   REF   3  LAST  973   21,2241  21'636 1    MSU    RHO1
0129                        21,2242  4 0000 0    COM
0130   REF   1               21,2243  55'502 C    TS     T5TEMP     (CDUY - RHO1)    SCALED 90 DEGS
0131                        21,2244  0 0006 1    EXTEND
0132   REF   2  LAST  106   21,2245  7 1640 C    MP     AMGB1
0133   REF   3  LAST  973   21,2246  21'516 C    DAS    DELTEMPX   DELTEMPX = (CDUX-RHO) + AMGB1(CDUY-RHO1)
A0134                                                              MUST BE DOUBLE PRECISION OR WILL LOSE
A0135                                                              PULSES
0136   REF   2  LAST  107   21,2247  3 1641 C    CA     AMGB4
0137                        21,2250  0 0006 1    EXTEND
0138   REF   2  LAST  973   21,2251  7 1502 C    MP     T5TEMP
0139   REF   2  LAST  105   21,2252  53'520 C    DXCH   DELTEMPY
0140   REF   2  LAST  107   21,2253  3 1643 1    CA     AMGB7
0141                        21,2254  0 0006 1    EXTEND
0142   REF   3  LAST  973   21,2255  7 1502 0    MP     T5TEMP
0143   REF   1               21,2256  53'522 1    DXCH   DELTEMPZ
0144   REF  14  LAST  933   21,2257  3 0034 C    CA     CDUZ
0145   REF   2  LAST  106   21,2260  57'637 1    XCH    RHO2
0146                        21,2261  0 0006 1    EXTEND
0147   REF   3  LAST  973   21,2262  21'637 C    MSU    RHO2
0148                        21,2263  4 0000 C    COM
0149   REF   4  LAST  973   21,2264  55'502 C    TS     T5TEMP     (CDUZ - RHO2)    SCALED 90 DEGS
0150                        21,2265  0 0006 1    EXTEND
0151   REF   2  LAST  107   21,2266  7 1642 1    MP     AMGB5
0152   REF   3  LAST  973   21,2267  21'520 C    DAS    DELTEMPY   DELTEMPY =AMGB4(CDUY-RHO1)
A01521                                                                        + AMGB5(CDUZ-RHO2)
0153   REF   2  LAST  107   21,2270  3 1644 C    CA     AMGB8
0154                        21,2271  0 0006 1    EXTEND
```

```
0155   REF   5  LAST  973   21,2272  7 1502 0          MP      T5TEMP
0156   REF   2  LAST  973   21,2273  21'522 1          DAS     DELTEMPZ      DELTEMPZ =AMGB7(CDUY-RHO1)
A01561                                                                              + AMGB8(CDUZ-RHO2)
0157   REF  39  LAST  972   21,2274  3 4711 1          CAF     TWO
0158   REF   5  LAST  973   21,2275  55'506 1 ADOTLOOP TS      SPNDX
0159                        21,2276  6 0000 1          DOUBLE
0160   REF   7  LAST  973   21,2277  55'507 0          TS      DPNDX
01601                       21,2300  0 0006 1          EXTEND
01602  REF   8  LAST  974   21,2301  5 1507 1          INDEX   DPNDX
01603  REF   4  LAST  973   21,2302  3 1516 1          DCA     DELTEMPX
01604  REF   9  LAST  974   21,2303  51'507 1          INDEX   DPNDX
01605  REF   5  LAST  973   21,2304  21'553 1          DAS     DRHO
01606                       21,2305  0 0006 1          EXTEND
01607  REF  10  LAST  974   21,2306  5 1507 1          INDEX   DPNDX
01608  REF   5  LAST  974   21,2307  3 1516 1          DCA     DELTEMPX
01609  REF  11  LAST  974   21,2310  51'507 1          INDEX   DPNDX
016091 REF   2  LAST  105   21,2311  21'542 1          DAS     MERRCRX
0161   REF  12  LAST  974   21,2312  51'507 1          INDEX   DPNDX
0162   REF   6  LAST  974   21,2313  3 1552 1          CA      DRHO
0163                        21,2314  6 0000 1          DOUBLE                N.B.
0164                        21,2315  6 0000 1          DOUBLE                N.B.
0165                        21,2316  0 0006 1          EXTEND
0166   REF   3  LAST  972   21,2317  5 1617 0          INDEX   ATTKALMN      PICK UP DESIRED FILTER GAINS
0167   REF   1               21,2320  7 3101 0          MP      GAIN2
0168   REF  13  LAST  974   21,2321  51'507 1          INDEX   DPNDX         ADOT  + (.16)(.1)DRHO
0169   REF   7  LAST  973   21,2322  21'534 0          DAS     ADOT              -1
0170   REF   6  LAST  974   21,2323  51'506 0          INDEX   SPNDX         S/C TORQUE TO INERTIA RATIO
0171   REF   3  LAST  688   21,2324  3 1620 1          CA      KMJ           SCALED (450)(1600)/(57.3)(16384)=1/1.3
0172                        21,2325  0 0006 1          EXTEND
0173   REF   7  LAST  974   21,2326  5 1506 0          INDEX   SPNDX
0174   REF   2  LAST  105   21,2327  7 1547 1          MP      DFT
0175   REF  14  LAST  974   21,2330  51'507 1          INDEX   DPNDX
0176   REF   8  LAST  974   21,2331  21'534 0          DAS     ADOT          KMJ(DFT)
0177   REF   8  LAST  974   21,2332  11'506 1          CCS     SPNDX
0178   REF   1               21,2333  1 2275 1          TCF     ADOTLOOP      END CALCULATION OF VEHICLE RATES
0179   REF   2  LAST  106   21,2334  3 1560 0 KMATRIX  CA      ATTSEC
0180   REF   2  LAST  830   21,2335  7 4721 0          MASK    LOW4
0181   REF 219  LAST  972   21,2336  10 000 0          CCS     A
0182   REF   1               21,2337  1 2345 0          TCF     TENTHSEK
0183   REF   5  LAST  971   21,2340  3 7671 0          CAF     PRIO34        CALL FOR 1 SEC UPDATE OF TRANSFORMATION
0184   REF  28  LAST  826   21,2341  0 5027 1          TC      NOVAC         MATRIX FROM GIMBAL AXES TO BODY AXES
0185   REF  18  LAST  973   E6,1510                   EBANK=  KNPAC
0186   REF   1               21,2342   03444 0         2CADR   AMBGUPDT
0186   REF   1               21,2343   44066 1
0187   REF   4  LAST  915   21,2344  3 4334 1          CAF     NINE

0188   REF   3  LAST  974   21,2345  55'560 1 TENTHSEK TS      ATTSEC
```

```
R0189   WHEN AUTOMATIC MANEUVERS ARE BEING PERFORMED, THE FOLLOWING ANGLE ADDITION MUST BE MADE TO PROVIDE A SMOOTH
R0191   SEQUENCE OF ANGULAR COMMANDS TO THE AUTOPILOT--

R0192           CDUXD = CDUXD + DELCDUX     (DOUBLE PRECISION)
R0193           CDUYD = CDUYD + DELCDUY     (DOUBLE PRECISION)
R0194           CDUZD = CDUZD + DELCDUZ     (DOUBLE PRECISION)

R0195   THE STEERING PROGRAMS-
R0196           1) ATTITUDE MANEUVER ROUTINE
R0198           2) LEM TRACKING

R0199   SHOULD GENERATE THE DESIRED ANGLES (CDUXD, CDUYD, CDUZD) AS WELL AS THE INCREMENTAL ANGLES (DELCDUX, DELCDUY,
R0201   DELCDUZ) SO THAT THE GIMBAL ANGLE COMMANDS CAN BE INTERPOLATED BETWEEN UPDATES.

R0203   HOLDFLAG CODING-

R0204       + = GRAB PRESENT CDU ANGLES AND STORE IN THETADX, THETADY, THETADZ
R0205           AND PERFORM ATTITUDE HOLD ABOUT THESE ANGLES
R0206           ALSO IGNORE AUTOMATIC STEERING
R0207           SET = + BY
R0208                   1) INITIALIZATION PHASE OF AUTOPILOT
R0209                   2) OCCURANCE OF RHC COMMANDS
R0210                   3) FREE MODE
R0211                   4) SWITCH OVER TO ATTITUDE HOLD FROM AUTO
R0212                      WHILE DOING AUTOMATIC STEERING (IN THIS CASE
R0212C3                    HOLDFLAG IS NOT ACTUALLY SET TO +, BUT THE LOGIC
R0212C5                    FUNCTIONS AS IF IT WERE.)
R0212I                  5) S/C CONTROL SWITCH IN SCS
R0212J                  6) IMU POWER OFF
R0213       +C = IN ATTITUDE HOLD ABOUT A PREVIOUSLY ESTABLISHED REFERENCE
R0214       -  = PERFORMING AUTOMATIC MANEUVER
R0215       -C = NOT USED AT PRESENT


R0216           NOTE THAT THIS FLAG MUST BE  SET = -  BY THE STEERING PROGRAM IF IT IS TO COMMAND THE AUTOPILOT.
R0218   SINCE ASTRONAUT ACTION MAY CHANGE THE HOLDFLAG SETTING, IT SHOULD BE MONITORED BY THE STEERING PROGRAM TO
R0220   DETERMINE IF THE AUTOMATIC SEQUENCE HAS BEEN INTERRUPTED AND IF SO, TAKE APPROPRIATE ACTION.


 0222   REF   9  LAST  972    21,2346  4 1332 0            CS      HOLDFLAG
 0223                         21,2347  0 0006 1            EXTEND
 0224   REF   1               21,2350  6 2375 1            BZMF    DACNDLS         IF HOLDFLAG +0,-0,+, BYPASS AUTOMATIC
A0225                                                                               COMMANDS
 0226   REF  40  LAST  974    21,2351  3 4711 1  DCDUINCR  CAF     TWO
 0227   REF   9  LAST  974    21,2352  55*506 1  DELOOP    TS      SPNDX
 0228                         21,2353  6 0000 1            DOUBLE
 0229   REF  15  LAST  974    21,2354  55*507 0            TS      DPNDX
 0230                         21,2355  0 0006 1            EXTEND
 0231   REF 220  LAST  974    21,2356  5 0000 1            INDEX   A
 0232   REF   9  LAST  583    21,2357  3 1647 0            DCA     CDUXD
```

```
0233   REF  19  LAST  974   21,2360  53'511 1        DXCH   KMPAC
0234                        21,2361  0 0006 1        EXTEND
0235   REF  16  LAST  975   21,2362  5 1507 1        INDEX  DPNDX
0236   REF   6  LAST  584   21,2363  3 1576 1        DCA    DELCDUX
0237   REF   1              21,2364  0 2040 1        TC     DPADD
0238                        21,2365  0 0006 1        EXTEND
0239   REF  20  LAST  976   21,2366  3 1511 C        DCA    KMPAC
0240   REF  10  LAST  975   21,2367  51'506 C        INDEX  SPNDX
0241   REF   5  LAST  640   21,2370  55'572 1        TS     THETADX
0242   REF  17  LAST  976   21,2371  51'507 1        INDEX  DPNDX
0243   REF  10  LAST  975   21,2372  53'647 1        DXCH   CDUXD
0244   REF  11  LAST  976   21,2373  11'506 1        CCS    SPNDX
0245   REF   1              21,2374  1 2352 C        TCF    DELOCP
```

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R0246 RCS-CSM AUTOPILOT ATTITUDE ERROR DISPLAY

R0247 THREE TYPES OF ATTITUDE ERRORS MAY BE DISPLAYED ON THE FDAI-

R0248 MODE 1) AUTOPILOT FOLLOWING ERRORS SELECTED BY V61E
R0250 GENERATED INTERNALLY BY THE AUTOPILOT

R0251 MODE 2) TOTAL ATTITUDE ERRORS SELECTED BY V62E
R0253 WITH RESPECT TO THE CONTENTS OF N22

R02531 MODE 3) TOTAL ASTRONAUT ATTITUDE ERRORS SELECTED BY V63E
R02533 WITH RESPECT TO THE CONTENTS OF N17

R0254 MODE 1 IS PROVIDED AS A MONITOR OF THE RCS DAP AND ITS ABILITY TO TRACK AUTOMATIC STEERING COMMANDS. IN THIS
R0256 MODE THE ATTITUDE ERRORS WILL BE ZEROED WHEN THE CMC MODE SWITCH IS IN FREE

R0259 MODE 2 IS PROVIDED TO ASSIST THE CREW IN MANUALLY MANEUVERING THE S/C TO THE ATTITUDE (GIMBAL ANGLES) SPECIFIED
R0261 IN N22. THE ATTITUDE ERRORS WRT THESE ANGLES AND THE CURRENT CDU ANGLES ARE RESOLVED INTO S/C CONTROL AXES
R0263 AS A FLY-TO INDICATOR.

R02631 MODE 3 IS PROVIDED TO ASSIST THE CREW IN MANUALLY MANEUVERING THE S/C TO THE ATTITUDE (GIMBAL ANGLES) SPECIFIED
R02633 IN N17. THE ATTITUDE ERRORS WRT THESE ANGLES AND THE CURRENT CDU ANGLES ARE RESOLVED INTO S/C CONTROL AXES
R02635 AS A FLY-TO INDICATOR.

R0264 V66 IS PROVIDED TO LOAD N17 WITH A SNAPSHOT OF THE CURRENT CDU ANGLES, THUS SYNCHRONIZING THE MODE 3 DISPLAY
R0266 WITH THE CURRENT S/C ATTITUDE. THIS VERB MAY BE USED AT ANY TIME.

R0269 THESE DISPLAYS WILL BE AVAILIABLE IN ANY MODE (AUTO, HOLD, FREE, G+N, OR SCS) ONCE THE RCS DAP HAS BEEN
R0271 INITIATED VIA V46E. MODE 1, HOWEVER, WILL BE MEANINGFUL ONLY IN G+N AUTO OR HOLD. THE CREW MAY PRESET (VIA
R0273 V25N17) AN ATTITUDE REFERENCE (DESIRED GIMBAL ANGLES) INTO N17 AT ANY TIME.

```
0278  REF  19  LAST  972   21,2375  4 1501 C  CAGNDLS  CS      RCSFLAGS        ALTERNATE  BETWEEN FDAIDSP1 AND FDAIDSP2
0279  REF  32  LAST  697   21,2376  7 4707 1            MASK    BIT4
0280                       21,2377  0 0006 1            EXTEND
0281  REF   1              21,2400  1 3144 1            BZF     FDAIDSP2

0282  REF  20  LAST  977   21,2401  27'501 C  FDAIDSP1  ADS     RCSFLAGS
0283  REF   7  LAST  901   21,2402  0 2404 0            TC      NEEDLER
0284  REF  33  LAST  930   21,2403  1 5222 1  KRESUME1  TCF     RESUME          END PHASE 1
```

```
R0285   FDAI ATTITUDE ERROR DISPLAY SUBROUTINE

R0286   PROGRAM DESCRIPTION:    D. KEENE   5/24/67

R0287       THIS SUBROUTINE IS USED TO DISPLAY ATTITUDE ERRORS ON THE FDAI VIA THE DIGITAL TO ANALOG CONVERTERS (DACS)
R0289   IN THE CDUS.  CARE IS TAKEN TO METER OUT THE APPROPRIATE NUMBER OF PULSES TO THE IMU ERROR COUNTERS AND PREVENT
R0291   OVERFLOW, TO CONTROL THE RELAY SEQUENCING, AND TO AVOID INTERFERENCE WITH THE COARSE ALIGN LOOP WHICH ALSO USES
R0293   THE DACS.


R0294   CALLING SEQUENCE:

R0295       DURING THE INITIALIZATION SECTION OF THE USER'S PROGRAM, BIT3 OF RCSFLAGS SHOULD BE SET TO INITIATE THE
R0297   TURN-ON SEQUENCE WITHIN THE NEEDLES PROGRAM:

R0298           CS      RCSFLAGS        IN EBANK6
R0299           MASK    BIT3
R0300           ADS     RCSFLAGS

R0301   THEREAFTER, THE ATTITUDE ERRORS GENERATED BY THE USER SHOULD BE TRANSFERED TO THE FOLLOWING LOCATIONS IN EBANK6:

R0303           AK      SCALED 180 DEGREES  NOTE: THESE LOCATIONS ARE SUBJECT
R0304           AK1     SCALED 180 DEGREES        TO CHANGE
R0305           AK2     SCALED 180 DEGREES

R0306   FULL SCALED DEFLECTION CORRESPONDS TO 16 7/8 DEGREES OF ATTITUDE ERROR
R0307           (= 384 BITS IN IMU ERROR COUNTER)

R0308   A CALL TO NEEDLER WILL THEN UPDATE THE DISPLAY:

R0309           INHINT
R0310           TC      IBNKCALL        NOTE: EBANK SHOULD BE SET TO E6
R0311           CADR    NEEDLER
R0312           RELINT

R0313       THIS PROCESS SHOULD BE REPEATED EACH TIME THE ERRORS ARE UPDATED.  AT LEAST 3 PASSES THRU THE PROGRAM ARE
R0315   REQUIRED BEFORE ANYTHING IS ACTUALLY DISPLAYED ON THE ERROR METERS.
R0316   NOTE: EACH CALL TO NEEDLER MUST BE SEPARATED BY AT LEAST 50MS TO ASSURE PROPER RELAY SEQUENCING.

R0318   ERASABLE USED:
R0319                           AK          CDUXCMD
R0320                           AK1         CDUYCMD
R0321                           AK2         CDUZCMD
R0322                           EDRIVEX     A,L,Q
R0323                           EDRIVEY     T5TEMP
R0324                           EDRIVEZ     SPNDX

R0325   SWITCHES:               RCSFLAGS    BITS 3,2

R0326   I/O CHANNELS:           CHAN12      BIT 4 (COARSE ALIGN - READ ONLY)
```

```
R0327                          CHAN12     BIT 6 (IMU ERROR COUNTER ENABLE)
R0328                          CHAN14     BIT 13,14,15 (DAC ACTIVITY)


R0329   SIGN CONVENTION:      AK = THETAC - THETA
R0330              WHERE      THETAC = COMMAND ANGLE
R0331                         THETA  = PRESENT ANGLE


 0332   REF  33  LAST  977    21,2404  3 4707 0  NEEDLER  CAF    BIT4          CHECK FOR COARSE ALIGN ENABLE
 0333                         21,2405  0 0006 1           EXTEND                IF IN COARSE ALIGN DO NOT USE IMU
 0334   REF  33  LAST  915    21,2406  02 012 0           RAND   CHAN12        ERROR COUNTERS. DONT USE NEEDLES
 0335                         21,2407  0 0006 1           EXTEND
 0336   REF   1               21,2410  1 2415 1           BZF    NEEDLER1
 0337   REF  21  LAST  977    21,2411  4 1501 0           CS     RCSFLAGS      SET BIT3 FOR INITIALIZATION PASS
 0338   REF  29  LAST  957    21,2412  7 4710 1           MASK   BIT3
 0339   REF  22  LAST  979    21,2413  27'501 0           ADS    RCSFLAGS
 0340   REF 150  LAST  967    21,2414  0 0002 0           TC     Q

 0341   REF  23  LAST  979    21,2415  3 1501 1  NEEDLER1 CA     RCSFLAGS
 0342   REF  28  LAST  734    21,2416  7 6211 1           MASK   SIX
 0343                         21,2417  0 0006 1           EXTEND
 0344   REF   1               21,2420  1 2455 0           BZF    NEEDLES3
 0345   REF  30  LAST  979    21,2421  7 4710 1           MASK   BIT3
 0346                         21,2422  0 0006 1           EXTEND
 0347   REF   2  LAST  242    21,2423  1 2446 1           BZF    NEEDLER2      BIT3 = 0, BIT2 = 1

 0348   REF  38  LAST  972    21,2424  4 4705 0           CS     BIT6          FIRST PASS BIT3 = 1
 0349                         21,2425  0 0006 1           EXTEND                DISABLE IMU ERROR COUNTER TO ZERO DACS
 0350   REF  34  LAST  979    21,2426  03 012 1           WAND   CHAN12        MUST WAIT AT LEAST 60 MS BEFORE
 0351   REF 171  LAST  970    21,2427  4 4714 0  NEEDLE11 CS     ZERO          ENABLING COUNTERS.
 0352   REF  13  LAST  901    21,2430  55'476 1           TS     AK            ZERO THE INPUTS ON FIRST PASS
 0353   REF   4  LAST  925    21,2431  55'477 0           TS     AK1
 0354   REF   4  LAST  931    21,2432  55'500 1           TS     AK2
 0355   REF   2  LAST  112    21,2433  55'503 1           TS     EDRIVEX       ZERO THE DISPLAY REGISTERS
 0356   REF   2  LAST  112    21,2434  55'504 0           TS     EDRIVEY
 0357   REF   2  LAST  112    21,2435  55'505 1           TS     EDRIVEZ
 0358   REF   2  LAST  147    21,2436  54 050 0           TS     CDUXCMD       ZERO THE OUT COUNTERS
 0359   REF   2  LAST  147    21,2437  54 051 1           TS     CDUYCMD
 0360   REF   2  LAST  147    21,2440  54 052 1           TS     CDUZCMD
 0361   REF  29  LAST  979    21,2441  4 6211 1           CS     SIX           RESET RCSFLAGS FOR PASS2
 0362   REF  24  LAST  979    21,2442  7 1501 0           MASK   RCSFLAGS
 0363   REF  41  LAST  955    21,2443  6 4711 1           AD     BIT2
 0364   REF  25  LAST  979    21,2444  55'501 0           TS     RCSFLAGS
 0365   REF 191  LAST  979    21,2445  0 0002 0           TC     Q             END PASS1

 0366   REF  39  LAST  979    21,2446  3 4705 1  NEEDLER2 CAF    BIT6          ENABLE IMU ERROR COUNTERS
 0367                         21,2447  0 0006 1           EXTEND
 0368   REF  35  LAST  979    21,2450  05 012 1           WOR    CHAN12
 0369   REF  30  LAST  979    21,2451  4 6211 1           CS     SIX           RESET RCSFLAGS TO DISPLAY ATTITUDE
```

```
0370   REF  26  LAST  979   21,2452  7 1501 C            MASK   RCSFLAGS      ERRORS    WAIT ATLEAST 4 MS FOR
0371   REF  27  LAST  980   21,2453  55'501 0            TS     RCSFLAGS      RELAY CLOSURE
0372   REF 192  LAST  979   21,2454  0 0002 C            TC     Q

0373   REF  40  LAST  979   21,2455  3 4705 1  NEEDLES3  CAF    BIT6          CHECK TO SEE IF IMU ERROR COUNTER
0374                        21,2456  0 0006 1            EXTEND               IS ENABLED
0375   REF  36  LAST  979   21,2457  02 012 C            RAND   CHAN12
0376                        21,2460  0 0006 1            EXTEND               IF NOT RECYCLE NEEDLES
0377   REF   8  LAST  977   21,2461  1 2411 C            BZF    NEEDLER +5

0378   REF  41  LAST  979   21,2462  3 4711 1  NEEDLES   CAF    TWO
0379   REF  12  LAST  976   21,2463  55'506 1  DACLOOP   TS     SPNDX
0380   REF   3  LAST  973   21,2464  4 4676 0            CS     QUARTER
0381                        21,2465  0 0006 1            EXTEND
0382   REF  13  LAST  980   21,2466  5 1506 0            INDEX  SPNDX
0383   REF  14  LAST  979   21,2467  7 1476 1            MP     AK
0384   REF 122  LAST  966   21,2470  54 001 1            TS     L
0385   REF 221  LAST  979   21,2471  10 000 C            CCS    A
0386   REF   1              21,2472  3 2526 1            CA     DACLIMIT
0387                        21,2473  1 2475 1            TCF    +2
0388   REF   2  LAST  980   21,2474  4 2526 C            CS     DACLIMIT
0389   REF 123  LAST  980   21,2475  6 0001 C            AD     L
0390   REF   6  LAST  974   21,2476  55'502 C            TS     T5TEMP        OVFLO CHK
0391                        21,2477  1 2503 1            TCF    +4
0392   REF 222  LAST  980   21,2500  50 000 1            INDEX  A             ON OVERFLOW LIMIT OUTPUT TO +-384
0393   REF   3  LAST  980   21,2501  3 2526 1            CAF    DACLIMIT
0394   REF 124  LAST  980   21,2502  54 001 1            TS     L
0395   REF  14  LAST  980   21,2503  51'506 C            INDEX  SPNDX
0396   REF   3  LAST  979   21,2504  4 1503 1            CS     EDRIVEX       CURRENT VALUE OF DAC
0397   REF 125  LAST  980   21,2505  6 0001 C            AD     L
0398   REF  15  LAST  980   21,2506  51'506 C            INDEX  SPNDX
0399   REF   3  LAST  979   21,2507  26 050 C            ADS    CDUXCMD
0400   REF  16  LAST  980   21,2510  51'506 C            INDEX  SPNDX
0401   REF   4  LAST  980   21,2511  23'503 C            LXCH   EDRIVEX
0402   REF  17  LAST  980   21,2512  11'506 1            CCS    SPNDX
0403   REF   1              21,2513  1 2463 C            TCF    DACLOOP
0404   REF   4  LAST  586   21,2514  3 7707 C            CAF    13,14,15
0405                        21,2515  0 0006 1            EXTEND
0406   REF  12  LAST  943   21,2516  05 014 1            WOR    CHAN14        SET DAC ACTIVITY BITS
0407   REF 193  LAST  980   21,2517  0 0002 C            TC     Q

0408   REF   1              21,2520  3 2524 C  REINIT    CAF    DELAY200      ........TILT LOGIC
0409   REF  18  LAST  971   21,2521  54 030 C            TS     TIME5         REINITIALIZE DAP IN 200MS
0410   REF   7  LAST  971   21,2522  55'465 C            TS     T5PHASE
0411   REF  34  LAST  977   21,2523  1 5222 1            TCF    RESUME
0412                        21,2524   37754 C  DELAY200  DEC    16364         200MS

0413                        21,2525   77177 C            DEC    -384
```

```
0414                    21,2526   37200 1  DACLIMIT DEC    16000
0415                    21,2527   00600 1           DEC      384
```

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P0416   INITIALIZATION PROGRAM FOR RCS-CSM AUTOPILOT

R0417   THE FOLLOWING QUANTITIES WILL BE ZEROED AND SHOULD APPEAR IN CONSECUTIVE LOCATIONS IN MEMORY AFTER WBODY

R0419   WBODY   (+1)   DFT            TAU2
R0420   WBODY1  (+1)   DFT1           BIAS
R0421   WBODY2  (+1)   DFT2           BIAS1
R0422   ADOT    (+1)   DRHC   (+1)    BIAS2
R0423   ADOT1   (+1)   DRHC1  (+1)    ERRORX
R0424   ADOT2   (+1)   DRHC2  (+1)    ERRORY
R0425   MERRORX (+1)   ATTSEC         ERROR2
R0426   MERRORY (+1)   TAU
R0427   MERROR2 (+1)   TAU1
 0428   REF 103 LAST 970  21,2530  3 4712 1  FRESHDAP CAF   ONE        RESET HOLDFLAG TO STOP AUTOMATIC
 0429   REF  10 LAST 975  21,2531  55'332 0            TS    HOLDFLAG   STEERING AND PREPARE TO PICK UP AN
A0430                                                                  ATTITUDE HOLD REFERENCE

 0431   REF  37 LAST 902  21,2532  0 4633 0  REDAP     TC    IBNKCALL   DECODE DAPDATR1, DAPDATR2 FOR DEADBANDS
 0432   REF   2 LAST 246  21,2533   40145 0            CADR  S41.2      RATES, QUADFAILS, QUAD MANAGEMENT

 0433   REF  38 LAST 982  21,2534  0 4633 0            TC    IBNKCALL   DECODE IXX, IAVG AND CONVERT
 0434   REF   2 LAST 247  21,2535   40276 0            CADR  S40.14     TO AUTOPILOT GAINS

 0436   REF   1           21,2536  3 2607 1            CAF   NO.T5VAR   NO. LOCATIONS TO BE ZEROED MINUS ONE
 0437   REF  18 LAST 980  21,2537  55'506 1  ZEROT5    TS    SPNDX      ZERO ALL NECESSARY ERASABLE REGISTERS
 0438   REF 172 LAST 979  21,2540  3 4714 1            CAF   ZERO
 0439   REF  19 LAST 982  21,2541  51'506 0            INDEX SPNDX
 0440   REF  10 LAST 583  21,2542  55'525 0            TS    WBODY
 0441   REF  20 LAST 982  21,2543  11'506 1            CCS   SPNDX
 0442   REF   1           21,2544  1 2537 0            TCF   ZEROT5
 0443   REF   4 LAST 971  21,2545  0 2616 1            TCR   ZEROJET

 0444   REF 173 LAST 982  21,2546  4 4714 0            CS    ZERO
 0445   REF   2 LAST 106  21,2547  55'633 1            TS    CHANTEMP   INITIALIZE MINIMUM IMPULSE CONTROL

 04451  REF   2 LAST 106  21,2550  55'632 0            TS    CH31TEMP   INITIALIZE RHC POSITION MEMORY FOR
A04452                                                                 MANUAL RATE MODES
 0446   REF   1           21,2551  3 2610 1            CAF   =.24
 0447   REF   2 LAST 107  21,2552  55'654 0            TS    SLOPE      INITIALIZE SWITCHING LOGIC SLOPE

 0448   REF  11 LAST 903  21,2553  3 4710 0            CAF   FOUR
 0449   REF   3 LAST 971  21,2554  55'634 0            TS    T5TIME     PHASE 0 RESETS FOR PHASE 2 INTERRUPT IN
A0450                                                                  60MS. PHASE 2 RESETS FOR PHASE 1 RUPT
A04501                                                                 IN (80MS - T5TIME(40MS)). THEREFORE
A04502                                                                 PHASE 1 (RATEFILTER) BEGINS CYCLING 100
A04503                                                                 MS FROM NOW AND EVERY 100MS THEREAFTER

 0451   REF   5 LAST 781  21,2555  3 4717 1            CAF   ELEVEN
 0452   REF   4 LAST 974  21,2556  55'617 1            TS    ATTKALMN   RESET TO PICK UP KALMAN FILTER GAINS
A0453                                                                  TO INITIALIZE THE S/C ANGULAR RATES
```

```
 0473   REF  21  LAST  973   21,2557  3 0032 C          CA     CDUX
 0474   REF   4  LAST  973   21,2560  55'635 1          TS     RHO
 0475   REF  12  LAST  973   21,2561  3 0033 1          CA     CDUY
 0476   REF   4  LAST  973   21,2562  55'636 1          TS     RHO1
 0477   REF  15  LAST  973   21,2563  3 0034 C          CA     CDUZ
 0478   REF   4  LAST  973   21,2564  55'637 C          TS     RHO2
 0479   REF 174  LAST  982   21,2565  3 4714 1          CAF    ZERO      RESET AUTOPILOT TO BEGIN EXECUTING
 0480   REF   8  LAST  980   21,2566  55'465 C          TS     T5PHASE   PHASE2 OF PROGRAM

 0481   REF  27  LAST  972   21,2567  4 1321 1          CS     IMODES33  CHECK IMU STATUS
 0482   REF  41  LAST  980   21,2570  7 4705 C          MASK   BIT6      IF BIT6 = 0 IMU IN FINE ALIGN
 0483   REF 223  LAST  980   21,2571  10 000 0          CCS    A         IF BIT6 = 1 IMU NOT READY
 0484   REF   1              21,2572  1 2576 C          TCF    IMUACK
 0485   REF   5  LAST  982   21,2573  55'617 1          TS     ATTKALMN  CANNOT USE IMU
 0486   REF   1              21,2574  3 2612 C          CAF    RCSINITB  PROVIDE FREE CONTROL ONLY
 0487   REF   1              21,2575  1 2603 1          TCF    RCSSWIT   DONT START UP RATE FILTER
A0488                                                                   SIGNAL NO RATE FILTER

 0489   REF   6  LAST  974   21,2576  3 7671 C  IMUAOK  CAF    PRIO34    START MATRIX INITIALIZATION
 0490   REF  29  LAST  974   21,2577  0 5027 1          TC     NOVAC     BYPASS IF IMU NOT IN FINE ALIGN
 0491   REF  21  LAST  976   E6,1510                    EBANK= KMPAC
 0492   REF   2  LAST  974   21,2600   03444 C          2CADR  AMBGUPDT
 0492                        21,2601   44066 1
 0493   REF   1              21,2602  3 2611 C          CAF    RCSINIT   CLEAR BIT14 -ASSUME WE HAVE A GOOD IMU
 0494   REF  28  LAST  980   21,2603  55'501 C  RCSSWIT  TS     RCSFLAGS  CLEAR BIT1  -INITIALIZE T6 PROGRAM
A0495                                                                     SET BIT3  -INITIALIZE NEEDLES
A0496                                                                  CLEAR BIT4  -RESET FOR FDAIDSP1
 0497   REF   1              21,2604  3 2613 1          CAF    T5WAIT60  NEXT T5RUPT 60 MS FROM NOW TO ALLOW IMU
A0498                                                                  ERROR COUNTER TO ZERO.
A0499                                                                  (MINIMUM DELAY = 15 MS)
 0500   REF  19  LAST  980   21,2605  54 030 C          TS     TIME5     SINCE ATTKALMN IS +11, PROGRAM WILL THEN
 0501   REF  35  LAST  980   21,2606  0 5222 C          TC     RESUME    PICK UP THE KALMAN FILTER GAINS. RATE
A0502                                                                  FILTER WILL BEGIN OPERATING ZOOMS FROM
A0503                                                                  NOW

R0504   CONSTANTS USED IN INITIALIZATION PROGRAM

 0505                        21,2607   00044 1  NO.T5VAR DEC    36
 0506                        21,2610   07534 1  =.24     DEC    .24       = SLOPE OF 0.6/SEC
 0507                        21,2611   00004 C  RCSINIT  OCT    00004
 0508                        21,2612   20004 1  RCSINITB OCT    20004
 0509                        21,2613   37772 1  T5WAIT60 DEC    16378     = 6 CS
 0510   REF  22  LAST  983   E6,1510                    EBANK= KMPAC
 0511   REF   1              21,2614   03646 C  T6ADDR   2CADR  T6START
 0511   REF   1              21,2615   36066 1


053001 REF   6  LAST  982   21,2616  3 4717 1  ZEROJET  CAF    ELEVEN    ZERO  BLAST2, BLAST1, BLAST, YWORD2,
053002 REF  21  LAST  982   21,2617  55'506 1           TS     SPNDX     YWORD1, PWORD2, PWORD1, RWORD2,
053003 REF 175  LAST  983   21,2620  3 4714 1           CAF    ZERO      AND RWORD1.
```

```
053004 REF  22 LAST 983  21,2621  51'506 C          INDEX  SPNDX
053005 REF   2 LAST  99  21,2622  55'451 1          TS     RWORD1
053006 REF  23 LAST 984  21,2623  11'506 1          CCS    SPNDX
053007 REF   5 LAST 982  21,2624  1 2617 1          TCF    ZEROJET +1

053008 REF  12 LAST 982  21,2625  3 4710 C          CAF    FOUR
053009 REF   2 LAST  99  21,2626  55'462 1          TS     BLAST1 +1
05301  REF   7 LAST 983  21,2627  3 4717 1          CAF    ELEVEN
0531   REF   2 LAST  99  21,2630  55'464 1          TS     BLAST2 +1

0532   REF  69 LAST 955  21,2631  4 4712 C          CS     BIT1
0533   REF  29 LAST 983  21,2632  7 1501 C          MASK   RCSFLAGS
0534   REF  30 LAST 984  21,2633  55'501 C          TS     RCSFLAGS      RESET BIT1 OF RCSFLAGS TO 0

0535                     21,2634  0 0006 1          EXTEND
0536   REF   1           21,2635  3 2615 1          DCA    T6ADDR
0537   REF   3 LAST 954  21,2636  53'311 1          DXCH   T6LOC
0538   REF   1           21,2637  3 3034 C          CAF    =+14MS        ENABLE T6RUPT TO SHUT OFF JETS IN 14 MS.
0539   REF   3 LAST 954  21,2640  54 031 1          TS     TIME6
0540   REF  41 LAST 970  21,2641  3 4674 C          CAF    BIT15
0541                     21,2642  0 0006 1          EXTEND
0542   REF   9 LAST 955  21,2643  05 013 0          WOR    CHAN13

0543   REF 154 LAST 980  21,2644  0 0002 C          TC     Q

0544   REF   6 LAST 983  21,2645  11'617 1 T5PHASE2 CCS    ATTKALMN      IF (+) INITIALIZE RATE ESTIMATE
0545   REF   1           21,2646  1 3132 C          TCF    KALUPDT


0546                     21,2647  1 2651 C          TCF    +2            ONLY IF ATTKALMN POSITIVE
0547                     21,2650  1 2651 C          TCF    +1
0548   REF   2 LAST 971  21,2651  3 2142 1          CA     DELTATT2      RESET FOR PHASE3 IN 20 MS
0549   REF  20 LAST 983  21,2652  56 030 1          XCH    TIME5         (JET SELECTION LOGIC )
0550   REF   4 LAST 982  21,2653  27'634 C          ADS    T5TIME        TO COMPENSATE FOR DELAYS IN T5RUPT


05501  REF  31 LAST 984  21,2654  3 1501 1          CA     RCSFLAGS      IF A HIGH RATE AUTO MANEUVER IS IN
05502  REF  42 LAST 984  21,2655  7 4674 1          MASK   BIT15         PROGRESS (BIT 15 OF RCSFLAGS SET), SET
05503                     21,2656  0 0006 1          EXTEND               ATTKALMN TO -1
05504  REF   1           21,2657  1 2661 C          BZF    NOHIAUTO      OTHERWISE SET ATTKALMN TO 0.
05505  REF 104 LAST 982  21,2660  4 4712 C          CS     ONE
05506  REF   7 LAST 984  21,2661  55'617 1 NOHIAUTO TS     ATTKALMN
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P0551                MANUAL ROTATION COMMANDS
 0552   REF   1                  21,2662  4 3016 1        CS      OCT01760        RESET FORCED FIRING BITS (BITS 10 TO 5
 0553   REF  32  LAST  984       21,2663  7 1501 C        MASK    RCSFLAGS        OF RCSFLAGS) TO ZERO
 0554   REF  33  LAST  985       21,2664  55'501 C        TS      RCSFLAGS

 0555                            21,2665  0 0006 1        EXTEND
 0556   REF   8  LAST  972       21,2666  00 031 C        READ    CHAN31
 0557   REF 126  LAST  980       21,2667  54 001 1        TS      L
 0558   REF   3  LAST  982       21,2670  3 1632 1        CA      CH31TEMP
 0559                            21,2671  0 0006 1        EXTEND
 0560   REF  11  LAST  942       21,2672  06 001 C        RXOR    LCHAN
 0561   REF   1                  21,2673  7 3022 C        MASK    MANRCT          = OCT00077
 0562                            21,2674  0 0006 1        EXTEND
 0563   REF   1                  21,2675  6 2710 C        BZMF    NOCHANGE

 0564   REF 224  LAST  983       21,2676  22 000 1        LXCH    A
 0565   REF   4  LAST  985       21,2677  55'632 C        TS      CH31TEMP        SAVE CONTENTS OF CHANNEL 31 IN CH31TEMP

 0566   REF 127  LAST  985       21,2700  3 0001 C        CA      L
 0567                            21,2701  0 0006 1        EXTEND
 0568   REF  35  LAST  949       21,2702  7 4706 C        MP      BIT5            PUT BITS 6-1 OF A IN BITS 10-5 OF L
 0569   REF 128  LAST  985       21,2703  3 0001 C        CA      L
 0570   REF  34  LAST  985       21,2704  27'501 C        ADS     RCSFLAGS        SET FORCED FIRING BITS FOR AXES WITH
A0571                                                                            WITH CHANGES IN COMMAND. BITS 10,9 FOR
A0572                                                                            ROLL, BITS 8,7 FOR YAW, BITS 6,5 FOR
A0573                                                                            PITCH

 0574   REF  35  LAST  985       21,2705  4 1501 C        CS      RCSFLAGS        SET RATE DAMPING FLAGS (BITS 13,12,AND
 0575   REF   1                  21,2706  7 3023 1        MASK    OCT16000        11 OF RCSFLAGS)
 0576   REF  36  LAST  985       21,2707  27'501 C        ADS     RCSFLAGS

 0577   REF   5  LAST  985       21,2710  4 1632 C NOCHANGE CS    CH31TEMP
 0578   REF   2  LAST  985       21,2711  7 3022 C        MASK    MANRCT
 0579                            21,2712  0 0006 1        EXTEND
 0580   REF   1                  21,2713  6 3234 1        BZMF    AHFNOROT        IF NO MANUAL COMMANDS, GO TO AHFNOROT

 0581   REF  11  LAST  982       21,2714  55'332 C        TS      HOLDFLAG        SET HOLDFLAG +

 0582   REF   2  LAST  537       21,2715  0 3114 C        TC      STICKCHK        WHEN THE RHC IS OUT OF DETENT, PMANNDX,
A0583                                                                            YMANNDX, AND RMANNDX ARE ALL SET, BY
A0584                                                                            MEANS OF STICKCHK, TO 0, 1, OR 2 FOR NO,
A0585                                                                            +, OR - ROTATION RESPECTIVELY AS
A0586                                                                            COMMANDED BY THE RHC.

A0587                                                                            HOWEVER, IT IS WELL TO NOTE THAT AFTER
A0588                                                                            THE RHC IS RETURNED TO DETENT, THE
A0589                                                                            PROGRAM BRANCHES TO AHFNOROT AND AVOIDS
A0590                                                                            STICKCHK SO PMANNDX, YMANNDX, AND
A0591                                                                            RMANNDX ARE NOT RESET TO ZERO BUT RATHER
A0592                                                                            LEFT SET TO THEIR LAST OUT OF DETENT
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A0593                                                                   VALUES.

 0594   REF  22  LAST  776   21,2716  4 0075 1        CS      FLAGWRD1    SET STIKFLAG TO INFORM STEERING
 0595   REF  56  LAST  972   21,2717  7 4675 0        MASK    BIT14       PROGRAMS (P20) THAT ASTRONAUT HAS
 0596   REF  23  LAST  986   21,2720  26 075 1        ADS     FLAGWRD1    ASSUMED ROTATIONAL CONTROL OF SPACECRAFT

 0597   REF  57  LAST  986   21,2721  3 4675 1        CAF     BIT14
 0598                        21,2722  0 0006 1        EXTEND
 0599   REF   9  LAST  985   21,2723  02 031 1        RAND    CHAN31
 0600                        21,2724  0 0006 1        EXTEND
 0601   REF   1              21,2725  6 3035 1        BZMF    FREEFUNC

 0602   REF  37  LAST  985   21,2726  3 1501 1        CA      RCSFLAGS    EXAMINE RCSFLAGS TO SEE IF RATE FILTER
 0603   REF  58  LAST  986   21,2727  7 4675 0        MASK    BIT14       HAS BEEN INITIALIZED
 0604   REF 229  LAST  985   21,2730  10 000 0        CCS     A           IF SO, PROCEED WITH MANUAL RATE COMMANDS
 0605   REF   2  LAST  972   21,2731  1 2520 0        TCF     REINIT      .....TILT, RECYCLE TO INITIALIZE FILTER

 0606   REF  23  LAST  957   21,2732  4 4715 1        CS      FIVE        IF MANUAL MANEUVER IS AT HIGH RATE, SET
 0607   REF   5  LAST  684   21,2733  6 1130 1        AD      RATEINDX    ATTKALMN TO -1.
 0608                        21,2734  0 0006 1        EXTEND              OTHERWISE, LEAVE ATTKALMN ALONE.
 0609                        21,2735  6 2740 0        BZMF    +3
 0610   REF 105  LAST  984   21,2736  4 4712 0        CS      ONE
 0611   REF   8  LAST  984   21,2737  55'617 1        TS      ATTKALMN

 0614   REF  42  LAST  980   21,2740  3 4711 1        CAF     TWO         AUTO-HOLD MANUAL ROTATION
 0615   REF  24  LAST  984   21,2741  55'506 1 SETWBODY TS     SPNDX
 0616                        21,2742  6 0000 1        DOUBLE
 0617   REF  18  LAST  976   21,2743  55'507 0        TS      DPNDX
 0618   REF  25  LAST  986   21,2744  51'506 0        INDEX   SPNDX       RMANNDX = 0 NO ROTATION
 0619   REF   3  LAST  537   21,2745  3 1656 0        CA      RMANNDX             = 1  + ROTATION
 0620                        21,2746  0 0006 1        EXTEND              = 2  - ROTATION
 0621   REF   1              21,2747  1 2771 0        BZF     NORATE      IF NO ROTATION COMMAND ON THIS AXIS,
A0622                                                                   GO TO NORATE.

 0623   REF   6  LAST  986   21,2750  6 1130 1        AD      RATEINDX    RATEINDX = 0  0.05 DEG/SEC
 0624   REF 195  LAST  984   21,2751  54 002 1        TS      Q                    = 2  0.2 DEG/SEC
 0625   REF 196  LAST  986   21,2752  50 002 0        INDEX   Q                    = 4  0.5 DEG/SEC
 0626   REF   1              21,2753  3 3023 0        CA      MANTABLE -1          = 6  4.0 DEG/SEC
 0627                        21,2754  0 0006 1        EXTEND
 0628   REF  29  LAST  780   21,2755  7 4702 1        MP      BIT9        MULTIPLY MANTABLE BY 2 TO THE -6
 0629   REF  19  LAST  986   21,2756  51'507 1        INDEX   DPNDX       TO GET COMMANDED RATE.
 0630   REF  11  LAST  982   21,2757  53'526 0        DXCH    WBODY       SET WBODY TO COMMANDED RATE.

 0631   REF  38  LAST  986   21,2760  3 1501 1        CA      RCSFLAGS
 0632   REF   2  LAST  985   21,2761  7 3023 1        MASK    OCT16000    IS RATE DAMPING COMPLETED (BITS 13,12AND
 0633                        21,2762  0 0006 1        EXTEND              11 OF RCSFLAGS ALL ZERO.) IF SO, GO TO
 0634   REF   1              21,2763  1 3001 1        BZF     MERUPDAT    MERUPDAT TO UPDATE CUMULATIVE ATTITUDE
A0635                                                                   ERROR.
```

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0636  REF 176  LAST 983   21,2764  3 4714 1  ZERCER   CA     ZERO       ZERCER ZEROS MERRORS
0637                      21,2765  22 007 C            ZL
0638  REF  20  LAST 986   21,2766  51'507 1            INDEX  DPNDX
0639  REF   3  LAST 974   21,2767  53'542 1            DXCH   MERRORX
0640  REF   1            21,2770  1 3007 1            TCF    SPNDXCHK

0641                      21,2771  22 007 C  NORATE    ZL
0642  REF  21  LAST 987   21,2772  51'507 1            INDEX  DPNDX
0643  REF  12  LAST 986   21,2773  53'526 C            DXCH   WBODY      ZERO WBODY FOR THIS AXIS
0644  REF  39  LAST 986   21,2774  3 1501 1            CA     RCSFLAGS
0645  REF   3  LAST 986   21,2775  7 3023 1            MASK   OCT16000
0646                      21,2776  0 0006 1            EXTEND            IS RATE DAMPING COMPLETED
0647  REF   2  LAST 987   21,2777  1 3007 1            BZF    SPNDXCHK   YES, KEEP CURRENT MERRORX GO TO SPNDXCHK
0648  REF   1            21,3000  1 2764 1            TCF    ZERCER     NO,GO TO ZERCER

0649  REF 197  LAST 986   21,3001  50 002 C  MERUPDAT  INDEX  Q          MERRORX=MERRORX+MEASURED CHANGE IN ANGLE
0650  REF   2  LAST 986   21,3002  4 3023 1            CS     MANTABLE -1 -COMMANDED CHANGE IN ANGLE
0651                      21,3003  0 0006 1            EXTEND            THE ADDITION OF MEASURED CHANGE IN ANGLE
0652  REF  41  LAST 781   21,3004  7 4704 1            MP     BIT7       HAS ALREADY BEEN DONE IN THE RATE FILTER
0653  REF  22  LAST 987   21,3005  51'507 1            INDEX  DPNDX      COMMANDED CHANGE IN ANGLE = WBODY TIMES
0654  REF   4  LAST 987   21,3006  21'542 1            DAS    MERRORX    .1SEC = MANTABLE ENTRY TIMES 2 TO THE -8

0655  REF  23  LAST 987   21,3007  51'507 1  SPNDXCHK  INDEX  DPNDX
0656  REF   5  LAST 987   21,3010  3 1541 C            CA     MERRORX
0657  REF  26  LAST 986   21,3011  51'506 C            INDEX  SPNDX
0658  REF   6  LAST 970   21,3012  55'567 C            TS     ERRORX     ERRORX = HIGH ORDER WORD OF MERRORX
0659  REF  27  LAST 987   21,3013  11'506 1            CCS    SPNDX
0660  REF   1            21,3014  1 2741 C            TCF    SETWBODY
0661  REF   1            21,3015  1 3425 C            TCF    JETS


0662                      21,3016   01760 1  OCT01760 OCT    01760      FORCED FIRING BITS MASK

0663                      21,3017   01400 1  OCT01400 OCT    01400      ROLL FORCED FIRING MASK     ORDER OF
0664                      21,3020   00060 1  OCT00060 OCT    00060      PITCH FORCED FIRING MASK    DEFINITION
0665                      21,3021   00300 1  OCT00300 OCT    00300      YAW FORCED FIRING MASK      MUST BE
A0666                                                                                             PRESERVED
A0667                                                                                           FOR INDEXING
0668                      21,3022   00077 1  MANROT   OCT    77
0669                      21,3023   16000 C  OCT16000 OCT    16000      RATE DAMPING FLAGS MASK
0670                      21,3024   00165 C  MANTABLE DEC    .0071111
0671                      21,3025   77612 1            DEC    -.0071111
0672                      21,3026   00722 C            DEC    .028444
0673                      21,3027   77055 1            DEC    -.028444
0674                      21,3030   02215 C            DEC    .071111
0675                      21,3031   75562 1            DEC    -.071111
0676                      21,3032   22151 1            DEC    .568889
0677                      21,3033   55626 C            DEC    -.568889
0678                      21,3034   00027 1  =+14MS   DEC    23
0679  REF   4  LAST 986   21,3035  51'656 C  FREEFUNC  INDEX  RMANNDX     ACCELERATION
```

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0680    REF   1                 21,3036  3 3047 1          CA      FREETAU         COMMANDS
0681    REF   2  LAST  106      21,3037  55'561 0          TS      TAU
0682    REF   3  LAST  538      21,3040  51'657 1          INDEX   PMANNDX
0683    REF   2  LAST  988      21,3041  3 3047 1          CA      FREETAU         FREETAU     0 SEC
0684    REF   2  LAST  106      21,3042  55'562 0          TS      TAU1            +1          +0.10 SEC
0685    REF   3  LAST  538      21,3043  51'660 0          INDEX   YMANNDX         +2          -0.10 SEC
0686    REF   3  LAST  988      21,3044  3 3047 1          CA      FREETAU         (+3)        0 SEC
0687    REF   2  LAST  106      21,3045  55'563 1          TS      TAU2
0688    REF   1                 21,3046  1 3053 0          TCF     T6PROGM

0689                            21,3047   00000 1  FREETAU  DEC     0
0690                            21,3050   00740 1           DEC     480
0691                            21,3051   77037 0           DEC     -480
0692                            21,3052   00000 1           DEC     0

0693    REF 177  LAST  987      21,3053  3 4714 1  T6PROGM  CAF     ZERO            FOR MANUAL ROTATIONS
0694    REF   7  LAST  987      21,3054  55'567 0          TS      ERRORX
0695    REF   4  LAST  970      21,3055  55'570 0          TS      ERRORY
0696    REF   3  LAST  970      21,3056  55'571 1          TS      ERRORZ
0697    REF   1                 21,3057  1 3743 0          TCF     T6PROG
```

06975				21,3060	06604	0	DEC	.2112
0698				21,3061	32703	1	DEC	.8400
0699				21,3062	06604	0	DEC	.2112
0700				21,3063	02031	1 GAIN1	DEC	.0640
0701				21,3064	12132	1	DEC	.3180
0702				21,3065	13030	0	DEC	.3452
0703				21,3066	14047	1	DEC	.3774
0704				21,3067	15241	1	DEC	.4161
0705				21,3070	16650	0	DEC	.4634
0706				21,3071	20555	0	DEC	.5223
0707				21,3072	23065	0	DEC	.5970
0708				21,3073	26137	0	DEC	.6933
0709				21,3074	32053	0	DEC	.8151
0710				21,3075	35712	0	DEC	.9342
07105				21,3076	00435	0	DEC	.0174
0711				21,3077	13412	1	DEC	.3600
0712				21,3100	00435	0	DEC	.0174
0713				21,3101	00032	0 GAIN2	DEC	.0016
0714				21,3102	01350	0	DEC	.0454
0715				21,3103	01575	1	DEC	.0545
0716				21,3104	02103	1	DEC	.0666
0717				21,3105	02523	1	DEC	.0832
0718				21,3106	03327	1	DEC	.1069
0719				21,3107	04432	0	DEC	.1422
0720				21,3110	06264	1	DEC	.1985
0721				21,3111	11351	0	DEC	.2955
0722				21,3112	17324	1	DEC	.4817
0723				21,3113	33622	1	DEC	.8683
0724	REF	7 LAST	980	21,3114	55'502	0 STICKCHK	TS	T5TEMP
0725	REF	28 LAST	901	21,3115	7 6214	1	MASK	THREE
0726	REF	4 LAST	988	21,3116	55'657	0	TS	PMANNDX
0727	REF	8 LAST	989	21,3117	3 1502	1	CA	T5TEMP
0728				21,3120	0 0006	1	EXTEND	
0729	REF	4 LAST	980	21,3121	7 4676	0	MP	QUARTER
0730	REF	9 LAST	989	21,3122	55'502	0	TS	T5TEMP
0731	REF	29 LAST	989	21,3123	7 6214	1	MASK	THREE
0732	REF	4 LAST	988	21,3124	55'660	1	TS	YMANNDX
0733	REF	10 LAST	989	21,3125	3 1502	1	CA	T5TEMP
0734				21,3126	0 0006	1	EXTEND	
0735	REF	5 LAST	989	21,3127	7 4676	0	MP	QUARTER
0736	REF	5 LAST	987	21,3130	55'656	1	TS	RMANNDX
0737	REF	198 LAST	987	21,3131	0 0002	0	TC	Q
0738	REF	9 LAST	986	21,3132	55'617	1 KALUPDT	TS	ATTKALMN
0739								
0740	REF	1		21,3133	3 2141	1	CA	DELTATT
0741	REF	5 LAST	984	21,3134	6 1634	1	AD	T5TIME

06975	FILTER GAIN FOR TRANSLATION, LEM ON
0698	FILTER GAIN FOR TRANSLATION 2(ZETA)WN DT
0699	FILTER GAIN FOR 4 DEGREE/SEC MANEUVERS
0700	KALMAN FILTER GAINS FOR INITIALIZATION
0701	OF ATTITUDE RATES
07105	FILTER GAIN FOR TRANSLATION, LEM ON
0711	FILTER GAIN FOR TRANSLATION (WN)(WN)DT
0712	FILTER GAIN FOR 4 DEGREE/SEC MANEUVERS
0713	SCALED 10
0725	INDECES FOR MANUAL ROTATION
	MAN RATE 0 0 RATE (DP)
	+1 +RATE (DP)
	+2 -RATE (DP)
	(+3) 0 RATE (DP)
0738	INITIALIZATION OF ATTITUDE RATES USING
A0739	KALMAN FILTER TAKES 1.1 SEC
0740	=ISEC - 80MS
0741	+ DELAYS

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0742   REF  21  LAST  984   21,3135  54 030 C          TS      TIME5
0743                       21,3136  1 3141 1          TCF     +3
0744   REF   3  LAST  984   21,3137  3 2142 1          CAF     DELTATT2      SAFETY PLAY TO ASSURE
0745   REF  22  LAST  990   21,3140  54 030 C          TS      TIME5         A T5RUPT

0752   REF 178  LAST  988   21,3141  4 4714 C  KRESUME2 CS      ZERO          RESET FOR PHASE1
0753   REF   9  LAST  983   21,3142  55'465 C          TS      T5PHASE       RESUME INTERRUPTED PROGRAM
0754   REF  36  LAST  983   21,3143  1 5222 1          TCF     RESUME

0755   REF  34  LAST  979   21,3144  4 4707 1  FDAIDSP2 CS      BIT4          RESET FOR FDAIDSP1
0756   REF  40  LAST  987   21,3145  7 1501 C          MASK    RCSFLAGS
0757   REF  41  LAST  990   21,3146  55'501 C          TS      RCSFLAGS

0758   REF  11  LAST  781   21,3147  4 0074 C          CS      FLAGWRD0      ON - DISPLAY ONE OF THE TOTAL ATTITUDE
0759   REF  30  LAST  986   21,3150  7 4702 1          MASK    BIT9          ERRORS
0760                       21,3151  0 0006 1          EXTEND
0761   REF   1              21,3152  1 3161 C          BZF     FDAITOTL
0762                       21,3153  0 0006 1          EXTEND
0763   REF   8  LAST  988   21,3154  4 1570 C          DCS     ERRORX        OFF -DISPLAY AUTOPILOT FOLLOWING ERROR
0764   REF  15  LAST  980   21,3155  53'477 C          DXCH    AK
0765   REF   4  LAST  988   21,3156  4 1571 1          CS      ERRORZ
0766   REF   5  LAST  979   21,3157  55'500 1          TS      AK2
0767   REF  37  LAST  990   21,3160  1 5222 1          TCF     RESUME        END PHASE 1

0768   REF  14  LAST  903   21,3161  3 0105 C  FDAITOTL CA      FLAGWRD9
07681  REF  42  LAST  983   21,3162  7 4705 C          MASK    BIT6
07682                       21,3163  0 0006 1          EXTEND
07683  REF   1              21,3164  1 3227 1          BZF     WRTN17        IS N22ORN17 (BIT6 OF FLAGWRD9) = 0
A07684                                                                       IF SC, GO TO WRTN17
07685                       21,3165  0 0006 1  WRTN22   EXTEND                OTHERWISE, CONTINUE ON TO WRTN22 AND
0769   REF   2  LAST  410   21,3166  3 1157 C          DCA     CTHETA        GET SET TO COMPUTE TOTAL ATTITUDE
0770   REF   2  LAST  109   21,3167  53'514 1          DXCH    WTEMP         ERROR WRT N22 BY PICKING UP THE THREE
0771   REF   9  LAST  584   21,3170  3 1155 1          CA      CPHI          COMPONENTS OF N22

0772                       21,3171  0 0006 1  GETAKS   EXTEND                COMPUTE TOTAL ATTITUDE ERROR FOR
0773   REF  22  LAST  983   21,3172  20 032 1          MSU     CDUX          DISPLAY ON FDAI ERROR NEEDLES
0774   REF  16  LAST  990   21,3173  55'476 1          TS      AK
0775   REF   3  LAST  990   21,3174  3 1513 1          CA      WTEMP
0776                       21,3175  0 0006 1          EXTEND
0777   REF  13  LAST  983   21,3176  20 033 C          MSU     CDUY
0778   REF  11  LAST  989   21,3177  55'502 C          TS      T5TEMP
0779                       21,3200  0 0006 1          EXTEND
0780   REF   3  LAST  973   21,3201  7 1640 C          MP      AMGB1
0781   REF  17  LAST  990   21,3202  27'476 1          ADS     AK
0782   REF  12  LAST  990   21,3203  3 1502 1          CA      T5TEMP
0783                       21,3204  0 0006 1          EXTEND
0784   REF   3  LAST  973   21,3205  7 1641 1          MP      AMGB4
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0785  REF   5  LAST  979   21,3206  55'477 C          TS      AK1
0786  REF  13  LAST  990   21,3207  3 1502 1          CA      T5TEMP
0787                        21,3210  0 0006 1          EXTEND
0788  REF   3  LAST  973   21,3211  7 1643 C          MP      AMGB7
0789  REF   6  LAST  990   21,3212  55'500 1          TS      AK2
0790  REF   4  LAST  990   21,3213  3 1514 C          CA      WTEMP +1
0791                        21,3214  0 0006 1          EXTEND
0792  REF  16  LAST  983   21,3215  20 034 1          MSU     CDUZ
0793  REF  14  LAST  991   21,3216  55'502 C          TS      T5TEMP
0794                        21,3217  0 0006 1          EXTEND
0795  REF   3  LAST  973   21,3220  7 1642 1          MP      AMGB5
0796  REF   6  LAST  991   21,3221  27'477 C          ADS     AK1
0797  REF  15  LAST  991   21,3222  3 1502 1          CA      T5TEMP
0798                        21,3223  0 0006 1          EXTEND
0799  REF   3  LAST  973   21,3224  7 1644 1          MP      AMGB8
0800  REF   7  LAST  991   21,3225  27'500 1          ADS     AK2
0801  REF  38  LAST  990   21,3226  1 5222 1          TCF     RESUME      END PHASE1 OF RCS DAP

0802                        21,3227  0 0006 1  WRTN17  EXTEND             GET SET TO COMPUTE TOTAL ASTRONAUT
0803  REF   9  LAST  585   21,3230  3 1335 C          DCA     CPHIX +1    ATTITUDE ERROR WRT N17 BY PICKING UP
0804  REF   5  LAST  991   21,3231  53'514 1          DXCH    WTEMP       THE THREE COMPONENTS OF N17
0805  REF  10  LAST  991   21,3232  3 1333 C          CA      CPHIX
0806  REF   1               21,3233  1 3171 1          TCF     GETAKS
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0001                          21,3234                    BANK   21
0002  REF   3  LAST  970     21,2000                    SETLOC DAPS3
0003                          21,3234                    BANK

0004  REF   1                                          COUNT  21/DAPAM

0005  REF  23  LAST  983     E6,1510                    EBANK= KMPAC
0006                          21,3234  0 0006 1  AHFNOROT EXTEND
0007  REF  10  LAST  986     21,3235  00 031 C          READ   CHAN31
0008  REF  59  LAST  986     21,3236  7 4675 C          MASK   BIT14
0009                          21,3237  0 0006 1          EXTEND
0010  REF   1                 21,3240  6 3256 C          BZMF   FREECONT
0011  REF  42  LAST  990     21,3241  3 1501 1          CA     RCSFLAGS     SEE IF RATE FILTER HAS BEEN INITIALIZED
0012  REF  60  LAST  993     21,3242  7 4675 C          MASK   BIT14
0013  REF 226  LAST  986     21,3243  10 000 C          CCS    A            IF SO, PROCEED WITH ATTITUDE CONTROL
0014  REF   3  LAST  986     21,3244  1 2520 C          TCF    REINIT       IF NOT, RECYCLE TO INITIALIZE FILTER
A0015                                                                      AUTOMATIC CONTROL YET
0016                          21,3245  0 0006 1          EXTEND
0017  REF  11  LAST  993     21,3246  00 031 C          READ   CHAN31
0018  REF  39  LAST  938     21,3247  7 4676 C          MASK   BIT13
0019                          21,3250  0 0006 1          EXTEND
0020  REF   1                 21,3251  6 3356 1          BZMF   HOLDFUNC

0021  REF  12  LAST  985     21,3252  3 1332 1  AUTOCONT CA     HOLDFLAG     IF HOLDFLAG IS +, GO TO GRABANG.
0022                          21,3253  0 0006 1          EXTEND               OTHERWISE, GO TO ATTHOLD.
0023  REF   1                 21,3254  6 3306 1          BZMF   ATTHOLD
0024  REF   1                 21,3255  1 3362 1          TCF    GRABANG

R0026          MINIMUM IMPULSE CONTROL

0027  REF 106  LAST  986     21,3256  3 4712 1  FREECONT CAF    ONE
0028  REF  13  LAST  993     21,3257  55'332 C          TS     HOLDFLAG     RESET HOLDFLAG
A0029                                                                      INHIBIT AUTOMATIC STEERING
0030                          21,3260  0 0006 1          EXTEND
0031  REF   2  LAST  131     21,3261  00 032 C          READ   CHAN32
0032  REF 129  LAST  985     21,3262  54 001 1          TS     L
0033                          21,3263  4 0000 C          COM
0034  REF   3  LAST  985     21,3264  7 3022 C          MASK   MANRCT
0035  REF   3  LAST  982     21,3265  7 1633 1          MASK   CHANTEMP
0036  REF   4  LAST  993     21,3266  23'633 C          LXCH   CHANTEMP
0037  REF   3  LAST  985     21,3267  0 3114 C          TC     STICKCHK
0038  REF   6  LAST  989     21,3270  51'656 C          INDEX  RMANNDX
0039  REF   1                 21,3271  3 3302 C          CA     MINTAU       MINTAU  +0
0040  REF   3  LAST  988     21,3272  55'561 C          TS     TAU                  +1    +14MS MINIMUM IMPULSE
0041  REF   5  LAST  989     21,3273  51'657 1          INDEX  PMANNDX              +2    -14MS TIME
0042  REF   2  LAST  993     21,3274  3 3302 C          CA     MINTAU               +3    +0
0043  REF   3  LAST  988     21,3275  55'562 C          TS     TAU1
0044  REF   5  LAST  989     21,3276  51'660 C          INDEX  YMANNDX
0045  REF   3  LAST  993     21,3277  3 3302 C          CA     MINTAU
```
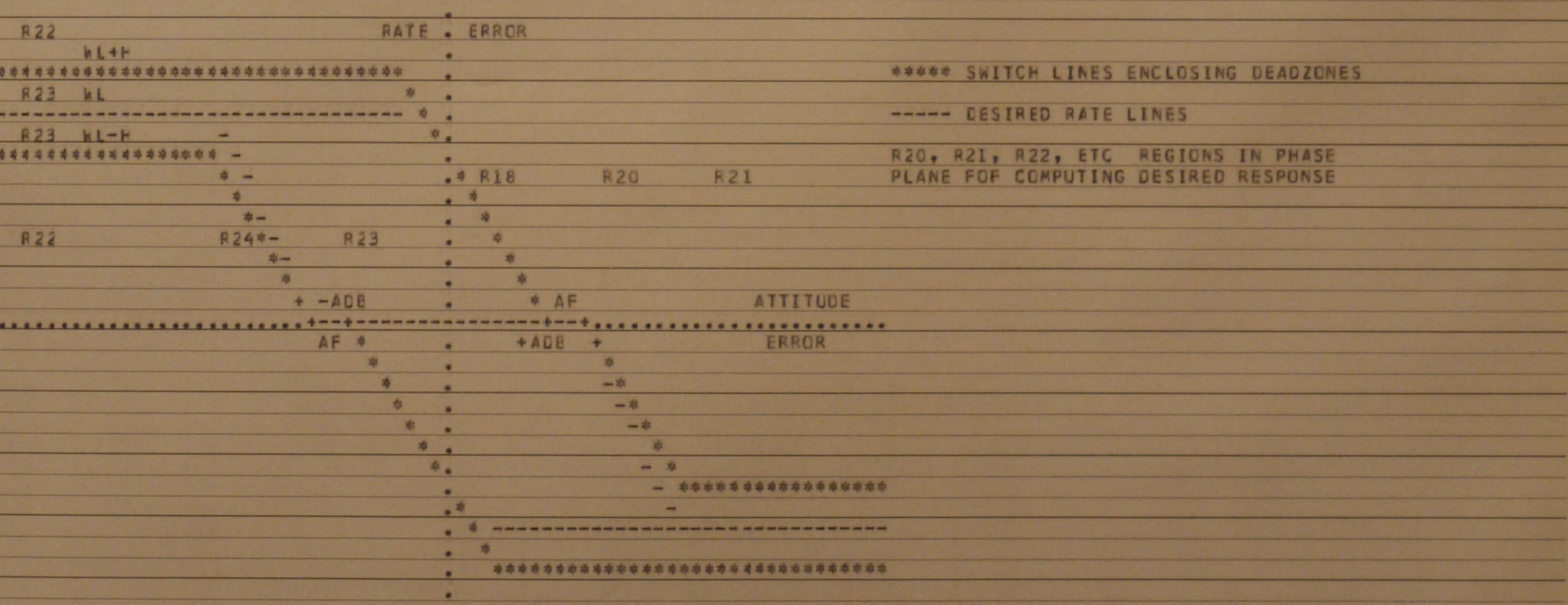

```
0046   REF   3  LAST  988   21,3300  55'563 1          TS      TAU2
0047   REF   2  LAST  988   21,3301  1 3053 0          TCF     T6PRCGM


0048                       21,3302  00000 1  MINTAU    DEC     0
0049                       21,3303  00027 1           DEC     23          = 14MS
0050                       21,3304  77750 0           DEC     -23         = -14MS
0051                       21,3305  00000 1           DEC     0
```

```
P0052          CALCULATION OF ATTITUDE ERRORS-

R0053            -   *   -     -       -
R0054            AK = AMGB (CDUX - THETADX) + BIAS

R0055  IE        *AK *   * 1   SIN(PSI)            0     ** CDUX - THETADX *    *BIAS *
R0057            *   *   *                               **                *    *     *
R0059            *AK1* = * 0   COS(PSI)COS(PHI)  SIN(PHI)** CDUY - THETADY *  + *BIAS1*
R0061            *   *   *                               **                *    *     *
R0063            *AK2*   * 0  -COS(PSI)SIN(PHI)  COS(PHI)** CDUZ - THETADZ *    *BIAS2*


R0065          THE BIASES ARE ADDED ONLY WHILE PERFORMING AUTOMATIC MANEUVERS (ESP KALCMANU) TC PROVIDE ADDITIONAL LEAD
R0067    AND PREVENT OVERSHOOT WHEN STARTING AN AUTOMATIC MANEUVER. NORMALLY THE REQUIRED LEAD IS ONLY 1-2 DEGREES.
R0069    BLT DLRING HIGH RATE MANEUVERS IT CAN BE AS MUCH AS 7 DEGREES.  THE BIASES ARE COMPUTED BY KALCMANU AND REMAIN
R0071    FIXED UNTIL THE MANEUVER IS COMPLETED AT WHICH TIME THEY ARE RESET TO ZERO.


 0075   REF  23  LAST  990    21,3306  3 0032 C  ATTHOLD  CA      CDUX
 0076                         21,3307  0 0006 1           EXTEND
 0077   REF   6  LAST  976    21,3310  21'572 1           MSU     THETADX
 0078   REF   9  LAST  990    21,3311  55'567 C           TS      ERRORX
 0079   REF  14  LAST  990    21,3312  3 0033 1           CA      CDUY
 0080                         21,3313  0 0006 1           EXTEND
 0081   REF   3  LAST  640    21,3314  21'573 C           MSU     THETADY
 0082   REF  16  LAST  991    21,3315  55'502 C           TS      TSTEMP
 0083                         21,3316  0 0006 1           EXTEND
 0084   REF   4  LAST  990    21,3317  7 1640 C           MP      AMGB1
 0085   REF  10  LAST  995    21,3320  27'567 C           ADS     ERRORX
 0086   REF  17  LAST  995    21,3321  3 1502 1           CA      TSTEMP
 0087                         21,3322  0 0006 1           EXTEND
 0088   REF   4  LAST  990    21,3323  7 1641 1           MP      AMGB4
 0089   REF   5  LAST  988    21,3324  55'570 C           TS      ERRORY
 0090   REF  18  LAST  995    21,3325  3 1502 1           CA      TSTEMP
 0091                         21,3326  0 0006 1           EXTEND
 0092   REF   4  LAST  991    21,3327  7 1643 C           MP      AMGB7
 0093   REF   5  LAST  990    21,3330  55'571 1           TS      ERRORZ
 0094   REF  17  LAST  991    21,3331  3 0034 C           CA      CDUZ
 0095                         21,3332  0 0006 1           EXTEND
 0096   REF   3  LAST  113    21,3333  21'574 1           MSU     THETADZ
 0097   REF  19  LAST  995    21,3334  55'502 C           TS      TSTEMP
 0098                         21,3335  0 0006 1           EXTEND
 0099   REF   4  LAST  991    21,3336  7 1642 1           MP      AMGB5
 0100   REF   6  LAST  995    21,3337  27'570 C           ADS     ERRORY
 0101   REF  20  LAST  995    21,3340  3 1502 1           CA      TSTEMP
 0102                         21,3341  0 0006 1           EXTEND
 0103   REF   4  LAST  991    21,3342  7 1644 1           MP      AMGB8
 0104   REF   6  LAST  995    21,3343  27'571 1           ADS     ERRORZ
 0105   REF  14  LAST  993    21,3344  4 1332 C           CS      HOLDFLAG
 0106                         21,3345  0 0006 1           EXTEND
```

```
0107   REF   2  LAST  987   21,3346  6 3425 1          BZMF   JETS
0108   REF   4  LAST  409   21,3347  3 1564 1          CA     BIAS      AD BIASES ONLY IF PERFORMING AUTOMATIC
0109   REF  11  LAST  995   21,3350  27'567 0          ADS    ERRORX
0110   REF   4  LAST  409   21,3351  3 1565 0          CA     BIAS1
0111   REF   7  LAST  995   21,3352  27'570 0          ADS    ERRORY
0112   REF   4  LAST  409   21,3353  3 1566 0          CA     BIAS2
0113   REF   7  LAST  995   21,3354  27'571 1          ADS    ERRORZ
0114   REF   3  LAST  996   21,3355  1 3425 0          TCF    JETS

0115   REF  15  LAST  995   21,3356  11'332 0 HOLDFUNC CCS    HOLDFLAG
0116                        21,3357  1 3362 1          TCF    +3
0117   REF   2  LAST  993   21,3360  1 3306 0          TCF    ATTHOLD
0118                        21,3361  1 3362 1          TCF    +1
0119   REF 179  LAST  990   21,3362  3 4714 1 GRABANG  CAF    ZERO      ZERO WBODYS AND BIASES
01191  REF  13  LAST  987   21,3363  55'525 0          TS     WBODY
01192  REF  14  LAST  996   21,3364  55'526 0          TS     WBODY +1
01193  REF   5  LAST  583   21,3365  55'527 1          TS     WBODY1
01194  REF   6  LAST  996   21,3366  55'530 1          TS     WBODY1 +1
01195  REF   6  LAST  583   21,3367  55'531 0          TS     WBODY2
01196  REF   7  LAST  996   21,3370  55'532 0          TS     WBODY2 +1
01197  REF   5  LAST  996   21,3371  55'564 0          TS     BIAS
01198  REF   5  LAST  996   21,3372  55'565 1          TS     BIAS1
01199  REF   5  LAST  996   21,3373  55'566 1          TS     BIAS2

0120   REF  43  LAST  993   21,3374  3 1501 1          CA     RCSFLAGS
01201  REF   4  LAST  987   21,3375  7 3023 1          MASK   OCT16000
012011                      21,3376  0 0006 1          EXTEND            IS RATE DAMPING COMPLETED
01202  REF   1              21,3377  1 3405 1          BZF    ENDDAMP    IF SC, GO TO ENDDAMP
01203  REF 180  LAST  996   21,3400  3 4714 1          CAF    ZERO       OTHERWISE, ZERO ERRORS
01204  REF  12  LAST  996   21,3401  55'567 0          TS     ERRORX
01205  REF   8  LAST  996   21,3402  55'570 0          TS     ERRORY
01206  REF   8  LAST  996   21,3403  55'571 1          TS     ERRORZ
01207  REF   4  LAST  996   21,3404  1 3425 0          TCF    JETS

01208  REF  16  LAST  996   21,3405  55'332 0 ENDDAMP  TS     HOLDFLAG  SET HOLDFLAG +0
01209                       21,3406  0 0006 1          EXTEND
0121   REF  24  LAST  995   21,3407  3 0033 1          DCA    CDUX      PICK UP CDU ANGLES FOR ATTITUDE HOLD
01211  REF   7  LAST  995   21,3410  53'573 0          DXCH   THETADX   REFERENCES
01212  REF  18  LAST  995   21,3411  3 0034 0          CA     CDUZ
01213  REF   4  LAST  995   21,3412  55'574 1          TS     THETADZ
01214  REF   3  LAST  996   21,3413  1 3306 0          TCF    ATTHOLD
```

P0130 JET SWITCHING LOGIC AND CALCULATION OF REQUIRED ROTATION COMMANDS

R0131 DETERMINE THE LOCATION OF THE RATE ERROR AND THE ATTITUDE ERROR RELATIVE TO THE SWITCHING LOGIC IN THE PHASE
R0133 PLANE.
R0134 COMPUTE THE CHANGE IN RATE CORRESPONDING TO THE ATTITUDE ERROR NECESSARY TO DRIVE THE THE S/C INTO THE
R0136 APPROPRIATE DEADZONE.



R0170 FIG. 1 PHASE PLANE SWITCHING LOGIC

R0171 CONSTANTS FOR JET SWITCHING LOGIC

```
0172  21,3414  00114 0  WLH/SLOP DEC     .00463          = WL+H/SLOPE = .83333 DEG      $180
0173  21,3415  00055 1  WL-H/SLP DEC     .00277          = WL-H/SLOPE = .5 DEG          $180
0174  21,3416  00022 1  WLH       2DEC    .0011111111     = WL+H = 0.5 DEG/SEC           $450
0174  21,3417  06426 1
0175  21,3420  00012 1  WLMH      2DEC    .0006666666     = WL-H = 0.3 DEG/SEC           $450
0175  21,3421  35415 1
0176  21,3422  00016 0  WL        2DEC    .0006888888     = WL   = 0.4 DEG/SEC           $450
0176  21,3423  22021 1
```

0177					21,3424	12173 1	SLOPE2	DEC	.32	= 0.8 DEG/SEC/DEG $450/180
0178	REF	5	LAST	685	21,3425	3 1655 0	JETS	CA	ADB	
0179	REF	13	LAST	984	21,3426	6 4710 0		AD	FOUR	AF = FLAT REGION = .044 DEG
0180	REF	21	LAST	995	21,3427	55'502 0		TS	T5TEMP	ADB+AF
0181	REF	43	LAST	986	21,3430	3 4711 1		CAF	TWO	
0182	REF	28	LAST	987	21,3431	55'506 1	JLOOP	TS	SPNDX	
0183					21,3432	6 0000 1		DOUBLE		
0184	REF	24	LAST	987	21,3433	55'507 0		TS	DPNDX	
0185					21,3434	0 0006 1		EXTEND		
0186	REF	227	LAST	993	21,3435	5 0000 1		INDEX	A	
0187	REF	9	LAST	974	21,3436	3 1534 1		DCA	ADOT	
0188	REF	2	LAST	105	21,3437	53'516 0		DXCH	EDOT	
0189	REF	17	LAST	996	21,3440	3 1332 1		CA	HOLDFLAG	HOLDFLAG = +0 MEANS THAT DAP IS IN
0190					21,3441	0 0006 1		EXTEND		ATTITUDE HOLD AND RATE DAMPING IS OVER.
0191	REF	1			21,3442	1 3447 1		BZF	INHOLD	IF THIS IS THE CASE, BYPASS ADDITION
A01911										OF WBODY AND GO TO INHOLD
0192					21,3443	0 0006 1		EXTEND		
0193	REF	25	LAST	998	21,3444	5 1507 1		INDEX	DPNDX	
0194	REF	15	LAST	996	21,3445	4 1526 0		DCS	WBODY	
0195	REF	3	LAST	998	21,3446	21'516 0		DAS	EDOT	= ADOT-WBODY
0196	REF	29	LAST	998	21,3447	51'506 0	INHOLD	INDEX	SPNDX	
0197	REF	13	LAST	996	21,3450	3 1567 1		CA	ERRORX	
0198	REF	2	LAST	105	21,3451	55'517 1		TS	AERR	AERR = BIAS + AK
0199	REF	4	LAST	998	21,3452	11'515 0		CCS	EDOT	
0200	REF	1			21,3453	1 3463 1		TCF	POSVEL	
0201	REF	1			21,3454	1 3456 1		TCF	SIGNCK1	
0202	REF	1			21,3455	1 3473 0		TCF	NEGVEL	
0203	REF	5	LAST	998	21,3456	11'516 0	SIGNCK1	CCS	EDOT +1	
0204	REF	2	LAST	998	21,3457	1 3463 1		TCF	POSVEL	
0205	REF	3	LAST	998	21,3460	1 3463 1		TCF	POSVEL	
0206	REF	2	LAST	998	21,3461	1 3473 0		TCF	NEGVEL	
0207	REF	3	LAST	998	21,3462	1 3473 0		TCF	NEGVEL	
0208					21,3463	0 0006 1	POSVEL	EXTEND		
0209	REF	6	LAST	998	21,3464	3 1516 1		DCA	EDOT	
0210	REF	2	LAST	105	21,3465	53'521 1		DXCH	EDOTVEL	
0211	REF	22	LAST	998	21,3466	3 1502 1		CA	T5TEMP	
0212	REF	1			21,3467	55'523 0		TS	ADBVEL	+(ADB+AF)
0213	REF	3	LAST	998	21,3470	3 1517 0		CA	AERR	
0214	REF	2	LAST	105	21,3471	55'522 1		TS	AERRVEL	
0215	REF	1			21,3472	0 3502 0		TC	J6.	
0216					21,3473	0 0006 1	NEGVEL	EXTEND		
0217	REF	7	LAST	998	21,3474	4 1516 0		DCS	EDOT	
0218	REF	3	LAST	998	21,3475	53'521 1		DXCH	EDOTVEL	
0219	REF	23	LAST	998	21,3476	4 1502 0		CS	T5TEMP	
0220	REF	2	LAST	998	21,3477	55'523 0		TS	ADBVEL	-(ADB+AF)
0221	REF	4	LAST	998	21,3500	4 1517 1		CS	AERR	
0222	REF	3	LAST	998	21,3501	55'522 1		TS	AERRVEL	
0223					21,3502	0 0006 1	J6.	EXTEND		

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0224  REF  6  LAST  998   21,3503  61'655 C          SU     ADB
0225  REF  1              21,3504  6 3414 C          AD     WLH/SLOP
0226                      21,3505  0 0006 1          EXTEND
0227  REF  1              21,3506  6 3535 1          BZMF   J8

0228  REF  24 LAST  998   21,3507  4 1502 C          CS     T5TEMP          (ADB+AF)
0229  REF  4  LAST  998   21,3510  6 1522 C          AD     AERRVEL
0230                      21,3511  0 0006 1          EXTEND
0231                      21,3512  6 3514 1          BZMF   +2
0232  REF  1              21,3513  1 3526 1          TCF    J7
0233                      21,3514  0 0006 1          EXTEND
0234  REF  4  LAST  998   21,3515  4 1521 1          DCS    EDOTVEL
0235                      21,3516  0 0006 1          EXTEND
0236  REF  3  LAST  982   21,3517  11'654 C          DV     SLOPE
0237                      21,3520  0 0006 1          EXTEND
0238  REF  5  LAST  999   21,3521  61'522 C          SU     AERRVEL
0239  REF  7  LAST  999   21,3522  6 1655 C          AD     ADB
0240                      21,3523  0 0006 1          EXTEND
0241  REF  1              21,3524  6 3614 1          BZMF   J18
0242  REF  1              21,3525  1 3670 1          TCF    J23

0243  REF  1              21,3526  4 3415 C  J7      CS     WL-H/SLP
0244                      21,3527  0 0006 1          EXTEND
0245  REF  25 LAST  999   21,3530  61'502 1          SU     T5TEMP          (ADB+AF)
0246  REF  6  LAST  999   21,3531  6 1522 C          AD     AERRVEL
0247                      21,3532  0 0006 1          EXTEND
0248  REF  1              21,3533  6 3620 C          BZMF   J20
0249  REF  1              21,3534  1 3631 1          TCF    J21

0250                      21,3535  0 0006 1  J8      EXTEND
0251  REF  1              21,3536  4 3417 1          DCS    WLH
0252  REF  6  LAST  991   21,3537  53'514 1          DXCH   WTEMP
0253                      21,3540  0 0006 1          EXTEND
0254  REF  5  LAST  999   21,3541  3 1521 C          DCA    EDOTVEL
0255  REF  7  LAST  999   21,3542  21'514 1          DAS    WTEMP
0256  REF  8  LAST  999   21,3543  11'513 C          CCS    WTEMP
0257  REF  1              21,3544  1 3657 1          TCF    J22
0258  REF  1              21,3545  1 3547 C          TCF    SIGNCK2
0259  REF  1              21,3546  1 3553 C          TCF    NJ22
0260  REF  9  LAST  999   21,3547  11'514 1  SIGNCK2  CCS    WTEMP +1
0261  REF  2  LAST  999   21,3550  1 3657 1          TCF    J22
0262  REF  3  LAST  999   21,3551  1 3657 1          TCF    J22
0263  REF  2  LAST  999   21,3552  1 3553 C          TCF    NJ22

0264                      21,3553  0 0006 1  NJ22     EXTEND
0265  REF  6  LAST  999   21,3554  3 1521 C          DCA    EDOTVEL
0266                      21,3555  0 0006 1          EXTEND
0267  REF  4  LAST  999   21,3556  11'654 C          DV     SLOPE
0268  REF  26 LAST  999   21,3557  6 1502 1          AD     T5TEMP          (ADB+AF)
0269  REF  7  LAST  999   21,3560  6 1522 C          AD     AERRVEL
```

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0270   REF 228  LAST  998   21,3561  10 000 C            CCS    A
0271   REF   2  LAST  999   21,3562  1 3670 1            TCF    J23
0272   REF   3  LAST 1000   21,3563  1 3670 1            TCF    J23
0273                        21,3564  1 3566 C            TCF    +2
0274   REF   4  LAST 1000   21,3565  1 3670 1            TCF    J23

0275                        21,3566  0 0006 1            EXTEND
0276   REF   1              21,3567  4 3421 1            DCS    WLMH          WL - H
0277   REF  10  LAST  999   21,3570  53*514 1            DXCH   WTEMP
0278                        21,3571  0 0006 1            EXTEND
0279   REF   7  LAST  999   21,3572  3 1521 C            DCA    EDOTVEL
0280   REF  11  LAST 1000   21,3573  21*514 1           DAS    WTEMP
0281   REF  12  LAST 1000   21,3574  11*513 C           CCS    WTEMP
0282   REF   5  LAST 1000   21,3575  1 3670 1            TCF    J23
0283   REF   1              21,3576  1 3600 C            TCF    SIGNCK3
0284   REF   1              21,3577  1 3604 1            TCF    NJ23
0285   REF  13  LAST 1000   21,3600  11*514 1  SIGNCK3   CCS    WTEMP +1
0286   REF   6  LAST 1000   21,3601  1 3670 1            TCF    J23
0287   REF   7  LAST 1000   21,3602  1 3670 1            TCF    J23
0288   REF   2  LAST 1000   21,3603  1 3604 1            TCF    NJ23

0289   REF   8  LAST  999   21,3604  3 1522 C  NJ23      CA     AERRVEL
0290   REF  27  LAST  999   21,3605  6 1502 1            AD     TSTEMP        (ADB+AF)
0291   REF   2  LAST  999   21,3606  6 3415 1            AD     WL-H/SLP
0292   REF 229  LAST 1000   21,3607  10 000 C            CCS    A
0293   REF   1              21,3610  1 3702 C            TCF    J24
0294   REF   2  LAST 1000   21,3611  1 3702 C            TCF    J24
0295   REF   4  LAST  999   21,3612  1 3657 1            TCF    J22
0296   REF   5  LAST 1000   21,3613  1 3657 1            TCF    J22

0297                        21,3614  0 0006 1  J18       EXTEND
0298   REF   8  LAST  998   21,3615  4 1516 C            DCS    EDOT
0299   REF  24  LAST  993   21,3616  53*511 1            DXCH   KMPAC
0300   REF   1              21,3617  1 3713 C            TCF    JTIME

0301   REF   5  LAST  998   21,3620  4 1517 1  J20       CS     AERR
0302   REF   3  LAST  998   21,3621  6 1523 1            AD     ADBVEL
0303                        21,3622  0 0006 1            EXTEND
0304   REF   1              21,3623  7 3424 1            MP     SLOPE2        (HYSTERESIS SLOPE)
0305   REF  25  LAST 1000   21,3624  53*511 1            DXCH   KMPAC
0306                        21,3625  0 0006 1            EXTEND
0307   REF   9  LAST 1000   21,3626  4 1516 C            DCS    EDOT
0308   REF  26  LAST 1000   21,3627  21*511 1           DAS    KMPAC
0309   REF   2  LAST 1000   21,3630  1 3713 C            TCF    JTIME

0310   REF  10  LAST 1000   21,3631  11*515 C  J21       CCS    EDOT
0311   REF   1              21,3632  1 3650 C            TCF    JP
0312   REF   1              21,3633  1 3635 C            TCF    SIGNCK4
0313   REF   1              21,3634  1 3641 C            TCF    JN
0314   REF  11  LAST 1000   21,3635  11*516 C SIGNCK4     CCS    EDOT +1
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0315   REF   2  LAST 1000   21,3636  1 3650 C          TCF    JP
0316   REF   3  LAST 1001   21,3637  1 3650 C          TCF    JP
0317   REF   2  LAST 1000   21,3640  1 3641 0          TCF    JN
0318                        21,3641  0 0006 1  JN      EXTEND
0319   REF  12  LAST 1000   21,3642  4 1516 C          DCS    EDOT
0320   REF  27  LAST 1000   21,3643  53'511 1          DXCH   KMPAC
0321                        21,3644  0 0006 1          EXTEND
0322   REF   1              21,3645  3 3423 1          DCA    WL
0323   REF  28  LAST 1001   21,3646  21'511 1          DAS    KMPAC
0324   REF   3  LAST 1000   21,3647  1 3713 C          TCF    JTIME

0325                        21,3650  0 0006 1  JP      EXTEND
0326   REF  13  LAST 1001   21,3651  4 1516 C          DCS    EDOT
0327   REF  29  LAST 1001   21,3652  53'511 1          DXCH   KMPAC
0328                        21,3653  0 0006 1          EXTEND
0329   REF   2  LAST 1001   21,3654  4 3423 0          DCS    WL
0330   REF  30  LAST 1001   21,3655  21'511 1          DAS    KMPAC
0331   REF   4  LAST 1001   21,3656  1 3713 C          TCF    JTIME

0332   REF  14  LAST 1001   21,3657  11'515 0  J22     CCS    EDOT
0333   REF   3  LAST 1001   21,3660  1 3641 C          TCF    JN
0334   REF   1              21,3661  1 3663 C          TCF    SIGNCK5
0335   REF   4  LAST 1001   21,3662  1 3650 C          TCF    JP
0336   REF  15  LAST 1001   21,3663  11'516 C SIGNCK5   CCS    EDOT +1
0337   REF   4  LAST 1001   21,3664  1 3641 C          TCF    JN
0338   REF   5  LAST 1001   21,3665  1 3641 0          TCF    JN
0339   REF   5  LAST 1001   21,3666  1 3650 C          TCF    JP
0340   REF   6  LAST 1001   21,3667  1 3650 C          TCF    JP

0341   REF  30  LAST  998   21,3670  51'506 C  J23     INDEX  SPNDX
034151 REF  40  LAST  999   21,3671  4 4676 C          CS     BIT13      RESET RATE DAMPING FLAG
034152 REF  44  LAST  996   21,3672  7 1501 C          MASK   RCSFLAGS   BIT13 FOR RCLL  (SPNDX = 0)
034153 REF  45  LAST 1001   21,3673  55'501 C          TS     RCSFLAGS   BIT12 FOR PITCH (SPNDX = 1)
A034154                                                                 BIT11 FOR YAW   (SPNDX = 2)

034155 REF  31  LAST 1001   21,3674  51'506 C          INDEX  SPNDX
034156 REF   1              21,3675  3 3017 1          CAF    OCT01400   IS THERE TO BE A FORCED FIRING ON THIS
034157 REF  46  LAST 1001   21,3676  7 1501 C          MASK   RCSFLAGS   AXIS
034158                      21,3677  0 0006 1          EXTEND
034159 REF   1              21,3700  1 3734 C          BZF    DOJET +2   NO, GO TO DOJET +2 AND DO NOTHING

03416  REF   2  LAST  999   21,3701  1 3614 0          TCF    J18        YES, GO TO J18 AND FORCE A FIRING

0342   REF   6  LAST 1000   21,3702  4 1517 1  J24     CS     AERR
0343                        21,3703  0 0006 1          EXTEND
0344   REF   4  LAST 1000   21,3704  61'523 1          SU     ADBVEL
0345                        21,3705  0 0006 1          EXTEND
0346   REF   2  LAST 1000   21,3706  7 3424 1          MP     SLOPE2     (HYSTERESIS SLOPE)
0347   REF  31  LAST 1001   21,3707  53'511 1          DXCH   KMPAC
0348                        21,3710  0 0006 1          EXTEND
```

```
0349   REF  16  LAST 1001   21,3711  4 1516 (          DCS    EOOT
0350   REF  32  LAST 1001   21,3712  21*511 1          DAS    KMPAC
```

```
P0351        COMPUTE THE JET ON TIME NECESSARY TO ACCOMPLISH THE DESIRED CHANGE IN RATE, IE

R0353              T  = J/M(DELTA W)
R0354               J

R0355       DELTA W = DESIRED CHANGE IN S/C ANGULAR RATE AS DETERMINED BY THE
R0356                 SWITCHING LOGIC,  AT THIS POINT STORED IN KMPAC.

R0357          J/M  = S/C INERTIA TO TORQUE RATIO  SCALED BY
R0358                   (57.3/450)(B24/1600)(1/.8)
R0359                 FOR 1 JET OPERATION  (M = 700 FT-LB).
R0360                 IE  J/M = J(SLUG-FTFT) X C.C0000085601606

R0361                 THE CORRESPONDING COMPUTER VARIABLES ESTABLISHED BY
R0362                 KEYBOARD ENTRY ARE
R0363                    J/M (ROLL)
R0364                    J/M1 (PITCH)
R0365                    J/M2 (YAW)

R0366           T   = JET ON-TIME      SCALED 16384/1600 SEC
R0367            J

R0368                 THE COMPUTER VARIABLES ARE
R0369                    TAU  (ROLL)
R0370                    TAU1 (PITCH)
R0371                    TAU2 (YAW)


0372   REF  32  LAST 1001   21,3713  51'506 C  JTIME    INDEX  SPNDX    PICK UP S/C INERTIA/TORQUE RATIO
0373   REF   3  LAST  688   21,3714  3 1623 1           CA     J/M      SCALED (57.3/450)(824/1600)
0374   REF   2  LAST  973   21,3715  0 2026 1           TC     SMALLMP  FOR 1-JET OPERATION
0375   REF  28  LAST  952   21,3716  3 4700 1           CA     BIT11
0376   REF   3  LAST 1003   21,3717  0 2026 1           TC     SMALLMP
0377   REF  33  LAST 1002   21,3720  11'510 C           CCS    KMPAC
0378                        21,3721  1 3725 C           TCF    +4
0379   REF   1              21,3722  1 3731 0           TCF    TAUNORM
0380                        21,3723  1 3727 1           TCF    +4
0381   REF   2  LAST 1003   21,3724  1 3731 C           TCF    TAUNORM
0382   REF  26  LAST  970   21,3725  3 4672 C           CA     POSMAX
0383   REF   2  LAST 1001   21,3726  1 3732 C           TCF    DOJET
0384   REF   8  LAST  966   21,3727  3 4674 C           CA     NEGMAX
0385   REF   3  LAST 1003   21,3730  1 3732 C           TCF    DOJET

0386   REF  34  LAST 1003   21,3731  3 1511 C  TAUNORM  CA     KMPAC +1
0387   REF  33  LAST 1003   21,3732  51'506 C  DOJET    INDEX  SPNDX
0388   REF   4  LAST  993   21,3733  55'561 C           TS     TAU
0389   REF  34  LAST 1003   21,3734  11'506 1           CCS    SPNDX
0390   REF   1              21,3735  1 3431 C           TCF    JLOOP
0391   REF   2  LAST  988   21,3736  1 3743 C           TCF    T6PROG
```

```
0392   REF 181  LAST  996   21,3737  3 4714 1  ZEROCMDS CAF     ZERO
0393   REF   5  LAST 1003   21,3740  55'561 0            TS      TAU
0394   REF   4  LAST  993   21,3741  55'562 0            TS      TAU1
0395   REF   4  LAST  994   21,3742  55'563 1            TS      TAU2
0396                        21,3743  0 0006 1  T6PROG    EXTEND
0397   REF   1              21,3744  3 3750 0            DCA     JETADDR     WHEN THE ROTATION COMMANDS (TAUS)
0398   REF  20  LAST  970   21,3745  53'313 0            DXCH    T5LOC       HAVE BEEN DETERMINED
0399   REF  39  LAST  991   21,3746  1 5222 1            TCF     RESUME      RESET T5LOC FOR PHASE3

0400   REF  35  LAST 1003   E6,1510                      EBANK=  KMPAC
0401   REF   1              21,3747    02601 1  JETADDR 2CADR   JETSLECT
0401   REF   1              21,3750    36066 1
```

L RCS-CSM DAP EXECUTIVE PROGRAMS USER'S PAGE NO. 1 E0 S3

R0001 CALCULATION OF AMGB, AMBG ONCE EVERY SECOND

R0002 AMGB = 1 SIN(PSI) 0
R0003 0 COS(PSI)COS(PHI) SIN(PHI)
R0004 0 -COS(PSI)SIN(PHI) COS(PHI)
R0005
R0006 AMBG = 1 -TAN(PSI)COS(PHI) TAN(PSI)SIN(PHI)
R0007 0 COS(PHI)/COS(PSI) -SIN(PHI)/COS(PSI)
R0008 0 SIN(PHI) COS(PHI)
R0009
R0010 WHERE PHI AND PSI ARE CDU ANGLES
R0011
R0012

```
0013                          20,3550                    BANK   20
0014  REF   1                 22,2000                    SETLOC DAPS8
0015                          22,3444                    BANK

0016  REF   1                                            COUNT* $$/DAPEX
0017  REF  36  LAST 1004      E6,1510                    EBANK= KMPAC
0018  REF  25  LAST  901      22,3444  3 0102 1  AMBGUPDT CA     FLAGWRD6      CHECK FOR RCS AUTOPILOT
0019                          22,3445  0 0006 1           EXTEND
0020  REF 104  LAST  942      22,3446  6 5112 C           BZMF   ENDOFJOB      BIT15 = 0, BIT14 = 1
0021  REF  61  LAST  993      22,3447  7 4675 C           MASK   BIT14         IF NOT RCS, EXIT
0022                          22,3450  0 0006 1           EXTEND
0023  REF 105  LAST 1005      22,3451  1 5112 1           BZF    ENDOFJOB      TO PROTECT TVC DAP ON SWITCHOVER

0024  REF  19  LAST  996      22,3452  3 0034 C           CA     CDUZ
0025  REF   1                 22,3453  0 4770 C           TC     SPSIN2
0026  REF   5  LAST  995      22,3454  55'640 C           TS     AMGB1         CALCULATE AMGB
0027  REF  20  LAST 1005      22,3455  3 0034 C           CA     CDUZ
0028  REF   1                 22,3456  0 4767 C           TC     SPCOS2
0029  REF   2  LAST  107      22,3457  55'645 C           TS     CAPSI         MUST CHECK FOR GIMBAL LOCK
0030  REF   1                 22,3460  3 3504 0           CAF    QUADANGL      = 7.25  DEGREES JET QUAD ANGULAR OFFSET
0031                          22,3461  0 0006 1           EXTEND
0032  REF  25  LAST  996      22,3462  20 032 1           MSU    CDUX
0033                          22,3463  4 0000 C           COM                  CDUX - 7.25 DEG
0034  REF   1                 22,3464  0 4767 C           TC     SPCOS1
0035  REF   5  LAST  995      22,3465  55'644 1           TS     AMGB8
0036                          22,3466  0 0006 1           EXTEND
0037  REF   3  LAST 1005      22,3467  7 1645 C           MP     CAPSI
0038  REF   5  LAST  995      22,3470  55'641 1           TS     AMGB4
0039  REF   2  LAST 1005      22,3471  3 3504 C           CAF    QUADANGL
0040                          22,3472  0 0006 1           EXTEND
0041  REF  26  LAST 1005      22,3473  20 032 1           MSU    CDUX
0042                          22,3474  4 0000 C           COM                  CDUX - 7.25 DEG
0043  REF   1                 22,3475  0 4770 C           TC     SPSIN1
0044  REF   5  LAST  995      22,3476  55'642 1           TS     AMGB5
0045                          22,3477  0 0006 1           EXTEND
0046  REF   4  LAST 1005      22,3500  7 1645 C           MP     CAPSI
0047                          22,3501  4 0000 C           COM
```

```
0048   REF   5 LAST  995   22,3502  55'643 C            TS      AMG87
0049   REF 1C6 LAST 1005   22,3503  1 5112 1            TCF     ENDOFJOB
0050                       22,3504   01224 1 QUADANGL  DEC     660          = 7.25 DEGREES
```

L JET SELECTION LOGIC USER'S PAGE NO. 1 EO S3

```
0001                              21,3751                 BANK   21
0002  REF   2  LAST  96C         17,2000                 SETLOC DAPS4
0003                              17,2601                 BANK

0004  REF   1                                           COUNT  17/DAPJS

0005  REF  37  LAST 1009         E6,1510                 EBANK= KMPAC
R0006 EXAMINE CHANNEL 31 FOR TRANSLATION COMMANDS

0007  REF  18  LAST  97C         17,2601  22 016 C  JETSLECT LXCH   BANKRUPT
0008  REF   1                   17,2602  3 2663 0          CAF    DELTATT3      = 60 MS   RESET TO EXECUTE PHASE1
0009  REF   6  LAST  989         17,2603  6 1634 1          AD     T5TIME
0010  REF  23  LAST  99C         17,2604  54 030 C          TS     TIME5
0011                              17,2605  1 2610 0          TCF    +3
0012  REF   1                   17,2606  3 2664 1          CAF    DELATT20      = 20 MS   TO ASSURE A T5RUPT
0013  REF  24  LAST 1007         17,2607  54 030 C          TS     TIME5
0014  REF   1                   17,2610  3 3342 1          CAF    =14MS         RESET T6 TO INITIALIZE THE JET CHANNELS
0015  REF   4  LAST  984         17,2611  54 031 1          TS     TIME6         IN 14 MS
0016  REF   9  LAST 1003         17,2612  3 4674 0          CAF    NEGMAX
0017                              17,2613  0 0006 1          EXTEND
0018  REF  10  LAST  984         17,2614  05 013 C          WOR    CHAN13
0019                              17,2615  0 0006 1          EXTEND
0020  REF  14  LAST  97C         17,2616  22 012 1          QXCH   QRUPT
0021  REF   1                   17,2617  3 2662 1          CAF    XLNMASK       = 7700 OCT
0022                              17,2620  0 0006 1          EXTEND                EXAMINE THE TRANSLATION
0023  REF  12  LAST  993         17,2621  06 031 0          RXOR   CHAN31         HAND CONTROLLER
0024  REF   2  LAST 1007         17,2622  7 2662 C          MASK   XLNMASK
0025                              17,2623  0 0006 1          EXTEND
0026  REF   1                   17,2624  1 2665 1          BZF    NOXLNCMD
0027  REF  28  LAST 1000         17,2625  55'502 C          TS     T5TEMP
0028                              17,2626  0 0006 1          EXTEND
0029  REF  31  LAST  99C         17,2627  7 4702 1          MP     BIT9
0030  REF  30  LAST  989         17,2630  7 6214 1          MASK   THREE
0031  REF   3  LAST  105         17,2631  55'513 C          TS     XNDX1         AC QUAD  X-TRANSLATION INDEX
0032  REF   2  LAST  105         17,2632  55'514 1          TS     XNDX2         BD QUAD  X-TRANSLATION INDEX
0033  REF  29  LAST 1007         17,2633  3 1502 1          CA     T5TEMP
0034                              17,2634  0 0006 1          EXTEND                1 = + XLN
0035  REF  42  LAST  987         17,2635  7 4704 1          MP     BIT7          2 = - XLN
0036  REF  31  LAST 1007         17,2636  7 6214 1          MASK   THREE         3 = NO XLN
0037  REF   3  LAST  105         17,2637  55'515 0          TS     YNDX          Y-TRANSLATION INDEX

0038  REF  30  LAST 1007         17,2640  3 1502 1          CA     T5TEMP
0039                              17,2641  0 0006 1          EXTEND
0040  REF  36  LAST  985         17,2642  7 4706 C          MP     BIT5
0041  REF  32  LAST 1007         17,2643  7 6214 1          MASK   THREE
0042  REF   2  LAST  105         17,2644  55'516 C          TS     ZNDX          Z-TRANSLATION INDEX

0043  REF  7C  LAST  929         17,2645  3 1466 1          CA     DAPDATR1      SET ATTKALMN TO PICK UP FILTER GAINS FOR
00432 REF  62  LAST 1005         17,2646  7 4675 0          MASK   BIT14         TRANSLATIONS.
00434                             17,2647  0 0006 1          EXTEND                CHECK DAPDATR1 BIT 14 FOR LEM ATTACHED.
```

```
00436  REF   1                17,2650  1 2653 1           BZF    NOLEM
00438  REF  33  LAST 1007     17,2651  4 6214 1           CS     THREE      IF LEM IS ON, SET ATTKALMN = -3
0044                          17,2652  1 2654 C           TCF    +2
00442  REF  44  LAST  998     17,2653  4 4711 C  NOLEM     CS     TWO        IF LEM IS OFF, SET ATTKALMN = -2.
00444  REF  10  LAST  989     17,2654  55'617 1           TS     ATTKALMN
0045   REF   4  LAST  685     17,2655  11'631 C           CCS    XTRANS     (+, -1, 0)
0046   REF   4  LAST 1007     17,2656  55'513 0           TS     XNDX1      USING BD-X  ZERO XNDX1
0047   REF   1                17,2657  1 2671 1           TCF    PWORD
0048   REF   3  LAST 1007     17,2660  55'514 1           TS     XNDX2      USING AC-X  ZERO XNDX2
0049   REF   2  LAST 1008     17,2661  1 2671 1           TCF    PWORD
0050                          17,2662   07700 1  XLNMASK  OCT    7700

0051                          17,2663   37772 1  DELTATT3 DEC    16378      = 60 MS
0052                          17,2664   37776 C  DELATT20 DEC    16382      = 20 MS

0053   REF   5  LAST 1008     17,2665  55'513 C  NOXLNCMD TS     XNDX1      ZERO ALL REQUESTS FOR TRANSLATION
0054   REF   4  LAST 1008     17,2666  55'514 1           TS     XNDX2
0055   REF   4  LAST 1007     17,2667  55'515 C           TS     YNDX
0056   REF   3  LAST 1007     17,2670  55'516 C           TS     ZNDX

R0057  PITCH COMMANDS  TIMING(NO X-TRANS, NO QUAD FAILS) 32MCT

0058   REF   5  LAST 1004     17,2671  11'562 C  PWORD     CCS    TAU1       CHECK FOR PITCH COMMANDS
0059   REF 107  LAST  993     17,2672  3 4712 1           CAF    ONE
0060                          17,2673  1 2675 C           TCF    +2          0 = NO PITCH
0061   REF  45  LAST 1008     17,2674  3 4711 1           CAF    TWO        +1 =  + PITCH
0062   REF   2  LAST  105     17,2675  55'520 C           TS     PINDEX     +2 =  - PITCH

0063   REF   5  LAST  686     17,2676  11'626 C           CCS    RACFAIL    FLAG FOR REAL AC QUAD FAILURES
0064   REF   1                17,2677  1 2703 C           TCF    AFAILP
0065   REF   1                17,2700  1 2713 1           TCF    TABPCOM    0 = NO REAL AC FAILURES
0066   REF   1                17,2701  1 2705 C           TCF    CFAILP     + = A QUAD FAILED
0067   REF   2  LAST 1008     17,2702  1 2713 1           TCF    TABPCOM    - = C QUAD FAILED
A0068                                                                      IF FAILURES ARE PRESENT IGNORE
A0069                                                                      X-TRANSLATIONS ON THIS AXIS

0070   REF   5  LAST  974     17,2703  3 4334 1  AFAILP   CAF    NINE       IF FAILURE IS PRESENT IJET OPERATION
0071   REF   3  LAST 1008     17,2704  1 2715 1           TCF    TABPCOM +2 IS ASSUMED. IGNORE X-TRANSLATION
0072   REF   2  LAST  821     17,2705  3 5660 1  CFAILP   CAF    TWELVE
0073   REF   4  LAST 1008     17,2706  1 2715 1           TCF    TABPCOM +2

0074                          17,2707   00000 1  XLNNDX   DEC    0          INDECES FOR TRANSLATION COMMANDS
0075                          17,2710   00003 1           DEC    3          FOR USE IN TABLE LOOK UP
0076                          17,2711   00006 1           DEC    6
0077                          17,2712   00000 1           DEC    0

0078   REF   3  LAST  709       5660             TWELVE   =      OCT14
R0079  TABLE LOOK UP FOR PITCH COMMANDS WITH AND WITHOUT X-TRANSLATION AND AC QUAD FAILURES PRESENT.
R0081  BITS 9, 10 CONTAIN THE NUMBER OF PITCH JETS USED TO PERFORM THE PITCH ROTATION
```

```
0083   REF   6  LAST 1008   17,2713  51'513 1  TABPCOM  INDEX  XNDX1
0084   REF   1              17,2714  3 2707 C           CA     XLNNDX
0085   REF   3  LAST 1008   17,2715  6 1520 1           AD     PINDEX
0086   REF 230  LAST 1000   17,2716  50 000 1           INDEX  A
0087   REF   1              17,2717  3 2743 C           CA     PYTABLE
0088   REF   1              17,2720  7 2762 1           MASK   PJETS      =1417 OCT
0089   REF   2  LAST   99   17,2721  55'453 C           TS     PWORD1
0090                        17,2722  0 0006 1           EXTEND
0091   REF  43  LAST 1007   17,2723  7 4704 1           MP     BIT7
0092   REF   2  LAST  105   17,2724  55'523 C           TS     NPJETS     = NO. OF PITCH JETS

R0093  YAW JET COMMANDS  TIMING(NO X-TRANS, NO QUAD FAILURES)  32MCT

0094   REF   5  LAST 1004   17,2725  11'563 1  YWORD    CCS    TAU2       CHECK FOR YAW COMMANDS
0095   REF 108  LAST 1008   17,2726  3 4712 1           CAF    ONE
0096                        17,2727  1 2731 1           TCF    +2
0097   REF  46  LAST 1008   17,2730  3 4711 1           CAF    TWO
0098   REF   2  LAST  105   17,2731  55'521 1           TS     YINDEX     YAW ROTATION INDEX

0099   REF   5  LAST  686   17,2732  11'627 1           CCS    RBDFAIL    FLAG FOR B OR D QUAD FAILURES
0100   REF   1              17,2733  1 2737 1           TCF    BFAILY     0  = NO BD FAILURE
0101   REF   1              17,2734  1 2764 1           TCF    TABYCOM    +  = B QUAD FAILED
0102   REF   1              17,2735  1 2741 C           TCF    DFAILY     -  = D QUAD FAILED
0103   REF   2  LAST 1009   17,2736  1 2764 1           TCF    TABYCOM

0104   REF   6  LAST 1008   17,2737  3 4334 1  BFAILY   CAF    NINE
0105   REF   3  LAST 1009   17,2740  1 2766 C           TCF    TABYCOM +2
0106   REF   3  LAST 1008   17,2741  3 5660 1  DFAILY   CAF    TWELVE
0107   REF   4  LAST 1009   17,2742  1 2766 C           TCF    TABYCOM +2
```

```
P0108   TABLE FOR PITCH(YAW) COMMANDS
R0109   BITS 4,3,2,1 = PITCH, X-TRANSLATION JETS SELECTED
R0110   BITS     10,9 = NO. PITCH JETS USED TO PERFORM ROTATION
R0111   BITS 8,7,6,5 = YAW, X-TRANSLATION JETS SELECTED
R0112   BITS 12,11 : NO. YAW JETS USED TO PERFORM ROTATION

A0113                                                          ROT  TRANS  QUAD  BIAS
 0114                    17,2743  00000 1  PYTABLE  OCT  0      0    0            0
 0115                    17,2744  05125 1           OCT  5125   +    0            0
 0116                    17,2745  05252 1           OCT  5252   -    0            0
 0117                    17,2746  00231 1           OCT  0231   0    +            3
 0118                    17,2747  02421 1           OCT  2421   +    +            3
 0119                    17,2750  02610 1           OCT  2610   -    +            3
 0120                    17,2751  00146 1           OCT  0146   0    -            6
 0121                    17,2752  02504 1           OCT  2504   +    -            6
 0122                    17,2753  02442 1           OCT  2442   -    -            6
 0123                    17,2754  00000 1           OCT  0      0         A(8)    9
 0124                    17,2755  02421 1           OCT  2421   +         A(8)    9
 0125                    17,2756  02442 1           OCT  2442   -         A(8)    9
 0126                    17,2757  00000 1           OCT  0      0         C(D)   12
 0127                    17,2760  02504 1           OCT  2504   +         C(D)   12
 0128                    17,2761  02610 1           OCT  2610   -         C(D)   12

R0129   MASKS FOR PITCH AND YAW COMMANDS

 0130                    17,2762  01417 1  PJETS    OCT  1417
 0131                    17,2763  06360 1  YJETS    OCT  6360

R0132   TABLE LOOK UP FOR YAW COMMANDS WITH AND WITHOUT X-TRANSLATION AND AC QUAD FAILURES PRESENT
R0134   BITS 11, 12 CONTAIN THE NUMBER OF YAW JETS USED TO PERFORM THE YAW ROTATION

 0136   REF   5  LAST 1008   17,2764  51'514 0  TABYCOM  INDEX  XNDX2
 0137   REF   2  LAST 1009   17,2765  3 2707 0           CA     XLNNDX
 0138   REF   3  LAST 1009   17,2766  6 1521 0           AD     YINDEX
 0139   REF 231  LAST 1009   17,2767  50 000 1           INDEX  A
 0140   REF   2  LAST 1009   17,2770  3 2743 0           CA     PYTABLE
 0141   REF   1               17,2771  7 2763 0           MASK   YJETS      = 6360 OCT
 0142   REF   2  LAST   99    17,2772  55'455 0           TS     YWORD1
 0143                         17,2773  0 0006 1           EXTEND
 0144   REF  37  LAST 1007    17,2774  7 4706 0           MP     BIT5
 0145   REF   1               17,2775  55'524 1           TS     NYJETS     NO. OF YAW JETS USED TO PERFORM ROTATION
```

L JET SELECTION LOGIC USER'S PAGE NO. 5 E6 S3

P0146 RCLL COMMANDS TIMING(NO Y,Z TRANS, NO QUAD FAILS) 45MCT

```
0147   REF   6  LAST 1004   17,2776  11'561 C  RWORD   CCS    TAU      CHECK FOR RCLL COMMANDS
0148   REF 109  LAST 1009   17,2777  3 4712 1          CAF    ONE
0149                       17,3000  1 3002 1          TCF    +2
0150   REF  47  LAST 1009   17,3001  3 4711 1          CAF    TWO
0151   REF   2  LAST  109   17,3002  55'517 1          TS     RINDEX

0152   REF   3  LAST  686   17,3003  11'630 1          CCS    ACORBD   FLAG FOR AC OR BD QUAD SELECTION FOR
0153   REF   1               17,3004  1 3075 1          TCF    BDROLL   ROLL COMMANDS
0154   REF   2  LAST 1011   17,3005  1 3075 1          TCF    BDROLL   +, +0 = BD ROLL
0155                       17,3006  1 3007 1          TCF    +1       -, -0 = AC ROLL

0156   REF   6  LAST 1008   17,3007  11'626 C  ACRCLL  CCS    RACFAIL  CHECK FOR REAL FAILURES
0157   REF   1               17,3010  1 3014 C          TCF    RAFAIL   ON AC QUADS
0158   REF   1               17,3011  1 3024 C          TCF    RXLNS
0159   REF   1               17,3012  1 3016 1          TCF    RCFAIL
0160   REF   2  LAST 1011   17,3013  1 3024 C          TCF    RXLNS

0161   REF   7  LAST 1009   17,3014  3 4334 1  RAFAIL  CAF    NINE     QUAD FAILURE WILL GET
0162   REF   1               17,3015  1 3026 1          TCF    TABRCOM  1-JET OPERATION
0163   REF   4  LAST 1009   17,3016  3 5660 1  RCFAIL  CAF    TWELVE
0164   REF   2  LAST 1011   17,3017  1 3026 1          TCF    TABRCOM

0165                       17,3020  00000 1   XLNINDX DEC    0
0166                       17,3021  00001 0           DEC    1        INDECES FOR TRANSLATION
0167                       17,3022  00002 0           DEC    2
0168                       17,3023  00000 1           DEC    0
```

R0169 TABLE LOOK UP FOR AC-ROLL COMMANDS WITH AND WITHOUT Y-TRANSLATION AND ACQUAD FAILURES PRESENT
R0171 BITS 9,10,11 CONTAIN THE MAGNITUDE AND DIRECTION OF THE ROLL

```
0172   REF   5  LAST 1008   17,3024  51'515 1  RXLNS   INDEX  YNDX     NO AC QUAD FAILURES
0173   REF   3  LAST 1010   17,3025  3 2707 C          CA     XLNNDX   INCLUDE +,-,0, Y-TRANSLATION
0174   REF   3  LAST 1011   17,3026  6 1517 C  TABRCOM AD     RINDEX
0175   REF 232  LAST 1010   17,3027  50 000 1          INDEX  A
0176   REF   1               17,3030  3 3157 1          CA     RTABLE
0177   REF   1               17,3031  7 3176 C          MASK   ACRJETS  = 3760 OCT
0178   REF   3  LAST  984   17,3032  55'451 1          TS     RWORD1
```

R0179 CHECK FOR Z-TRANSLATIONS ON BD

```
0180   REF   4  LAST 1008   17,3033  3 1516 1  BDZCHECK CA    ZNDX
0181                       17,3034  0 0006 1          EXTEND
0182   REF   1               17,3035  6 3067 C          BZMF   NOBDZ    NO Z-TRANSLATION
```

```
P0183           TABLE LOCK UP FOR BD Z-TRANSLATION WITH AND WITHOUT REAL BD QUAD FAILURES.  Z-TRANSLATION WILL BE POSS-
R0185   IBLE AS LONG AS ROLL COMMANDS CAN BE SATISFIED WITH THE AC ROLL JETS.   CRITERION.. IF THE RESULTANT NET ROLL
R0187   COMMANDS = 0 (WITH Z-TRANSLATION) AND IF TAU = 0, THEN INCLUDE THE BD Z-TRANSLATION COMMANDS. IF THE RESULTANT
R0189   ROLL COMMAND = 0, AND IF TAU NZ, THEN IGNORE THE BD Z-TRANSLATION

0190  REF   6  LAST 1009   17,3036  11'627 1          CCS     RBDFAIL
0191  REF  34  LAST 1008   17,3037  3 6214 0          CAF     THREE
0192                       17,3040  1 3042 0          TCF     +2
0193  REF  31  LAST  979   17,3041  3 6211 0          CAF     SIX
0194  REF   5  LAST 1011   17,3042  51'516 1          INDEX   ZNDX
0195  REF   1              17,3043  6 3020 0          AD      XLNINDX
0196  REF 233  LAST 1011   17,3044  50 000 1          INDEX   A
0197  REF   1              17,3045  3 3200 0          CA      YZTABLE
0198  REF   1              17,3046  7 3211 1          MASK    BDZJETS     = 3417 OCT
0199  REF   4  LAST 1011   17,3047  6 1451 0          AD      RWORD1      ADD TO ROLL COMMANDS
0200  REF  31  LAST 1007   17,3050  55'502 0          TS      TSTEMP      IF POSSIBLE.  MUST CHECK TAU FIRST

0201                       17,3051  0 0006 1          EXTEND
0202  REF  44  LAST 1009   17,3052  7 4704 1          MP      BIT7        DETERMINE THE NET ROLL COMMAND WITH
0203  REF   1              17,3053  6 6061 0          AD      =-4         Z-TRANSLATION ADDED ON
0204  REF   2  LAST  105   17,3054  55'522 1          TS      NRJETS      NET NO. OF +,- ROLL JETS ON
0205                       17,3055  0 0006 1          EXTEND
0206  REF   1              17,3056  1 3062 1          BZF     TAUCHECK

0207  REF  32  LAST 1012   17,3057  3 1502 1  ACRBDZ  CA      TSTEMP      Z-TRANSLATION ACCEPTED EVEN THO WE MAY
0208  REF   5  LAST 1012   17,3060  55'451 1          TS      RWORD1      HAVE INTRODUCED AN UNDESIREABLE ROLL
0209  REF   1              17,3061  1 3323 1          TCF     ROLLTIME    BRANCH TO JET ON-TIME CALCULATIONS

0210  REF   7  LAST 1011   17,3062  11'561 0  TAUCHECK CCS    TAU
0211  REF   2  LAST 1011   17,3063  1 3067 1          TCF     NOBDZ
0212  REF   1              17,3064  1 3057 1          TCF     ACRBDZ
0213  REF   3  LAST 1012   17,3065  1 3067 1          TCF     NOBDZ
0214  REF   2  LAST 1012   17,3066  1 3057 1          TCF     ACRBDZ

0215  REF   6  LAST 1012   17,3067  3 1451 0  NOBDZ   CA      RWORD1      Z-TRANSLATION NOT ACCEPTED
0216                       17,3070  0 0006 1          EXTEND
0217  REF  45  LAST 1012   17,3071  7 4704 1          MP      BIT7
0218  REF   1              17,3072  6 7715 0          AD      =-2
0219  REF   3  LAST 1012   17,3073  55'522 1          TS      NRJETS
0220  REF   2  LAST 1012   17,3074  1 3323 1          TCF     ROLLTIME    BRANCH TO JET ON-TIME CALCULATION
```

P0221 BD QUAD SELECTION FOR ROLL COMMANDS

```
0222  REF   7  LAST 1012   17,3075  11'627 1  BDROLL   CCS     RBDFAIL
0223  REF   1              17,3076  1 3102 0           TCF     RBFAIL
0224  REF   1              17,3077  1 3106 1           TCF     RZXLNS
0225  REF   1              17,3100  1 3104 0           TCF     RDFAIL
0226  REF   2  LAST 1013   17,3101  1 3106 1           TCF     RZXLNS
0227  REF   8  LAST 1011   17,3102  3 4334 1  RBFAIL   CAF     NINE
0228  REF   1              17,3103  1 3110 0           TCF     TABRZCMD
0229  REF   5  LAST 1011   17,3104  3 5660 1  RDFAIL   CAF     TWELVE
0230  REF   2  LAST 1013   17,3105  1 3110 0           TCF     TABRZCMD

0231  REF   6  LAST 1012   17,3106  51'516 1  RZXLNS   INDEX   ZNDX      NO BD FAILURES
0232  REF   4  LAST 1011   17,3107  3 2707 0           CA      XLNNDX     +,-,0 Z-TRANSLATION PRESENT
0233  REF   4  LAST 1011   17,3110  6 1517 0  TABRZCMD AD      RINDEX
0234  REF 234  LAST 1012   17,3111  50 000 1           INDEX   A
0235  REF   2  LAST 1011   17,3112  3 3157 1           CA      RTABLE
0236  REF   1              17,3113  7 3177 1           MASK    BDRJETS    = 34017 OCT
0237  REF   7  LAST 1012   17,3114  55'451 1           TS      RWORD1

0238  REF   6  LAST 1011   17,3115  3 1515 1  ACYCHECK CA      YNDX       ANY Y-TRANSLATION
0239                       17,3116  0 0006 1           EXTEND
0240  REF   1              17,3117  1 3151 0           BZF     NOACY      NO Y-TRANSLATION
0241  REF   7  LAST 1011   17,3120  11'626 0           CCS     RACFAIL
0242  REF  35  LAST 1012   17,3121  3 6214 0           CAF     THREE
0243                       17,3122  1 3124 1           TCF     +2
0244  REF  32  LAST 1012   17,3123  3 6211 0           CAF     SIX
0245  REF   7  LAST 1013   17,3124  51'515 1           INDEX   YNDX
0246  REF   2  LAST 1012   17,3125  6 3020 0           AD      XLN1NDX
0247  REF 235  LAST 1013   17,3126  50 000 1           INDEX   A
0248  REF   2  LAST 1012   17,3127  3 3200 0           CA      YZTABLE
0249  REF   1              17,3130  7 3212 1           MASK    ACYJETS    = 34360 OCT
0250  REF   8  LAST 1013   17,3131  6 1451 0           AD      RWORD1
0251  REF  33  LAST 1012   17,3132  55'502 0           TS      T5TEMP
0252                       17,3133  0 0006 1           EXTEND             FOR EXPLANATION SEE CODING ON RTABLE
0253  REF  35  LAST  990   17,3134  7 4707 1           MP      BIT4
0254  REF   2  LAST 1012   17,3135  6 6061 0           AD      =-4
0255  REF   4  LAST 1012   17,3136  55'522 1           TS      NRJETS     NO. OF NET ROLL JETS
0256                       17,3137  0 0006 1           EXTEND
0257  REF   1              17,3140  1 3144 1           BZF     TAUCHCK    IF NRJETS = 0

0258  REF  34  LAST 1013   17,3141  3 1502 1  BDRACZ   CA      T5TEMP     Y-TRANSLATION ACCEPTED
0259  REF   9  LAST 1013   17,3142  55'451 1           TS      RWORD1
0260  REF   3  LAST 1012   17,3143  1 3323 1           TCF     ROLLTIME   BRANCH TO JET ON-TIME CALCULATIONS

0261  REF   8  LAST 1012   17,3144  11'561 0  TAUCHCK  CCS     TAU
0262  REF   2  LAST 1013   17,3145  1 3151 0           TCF     NOACY
0263  REF   1              17,3146  1 3141 1           TCF     BDRACZ
0264  REF   3  LAST 1013   17,3147  1 3151 0           TCF     NOACY
0265  REF   2  LAST 1013   17,3150  1 3141 1           TCF     BDRACZ
```

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```
0266   REF  10  LAST 1013   17,3151  3 1451 0  NOACY   CA      RWORD1        Y-TRANSLATION NOT ACCEPTED
0267                        17,3152  0 0006 1          EXTEND
0268   REF  36  LAST 1013   17,3153  7 4707 1          MP      BIT4
0269   REF   2  LAST 1012   17,3154  6 7715 0          AD      =-2
0270   REF   5  LAST 1013   17,3155  55'522 1          TS      NRJETS
0271   REF   4  LAST 1013   17,3156  1 3323 1          TCF     ROLLTIME
```

```
R0272            TABLE FOR ROLL, Y AND Z-TRANSLATION COMMANDS

R0273       EITHER AC OR BD ROLL MAY BE SELECTED. IF AC ROLL IS SELECTED, Y-TRANSLATIONS MAY BE SATISFIED SIMULTANEOUSLY
R0275    PROVIDED THAT THERE ARE NO AC QUAD FAILURES. IF THERE ARE AC FAILURES, Y-TRANSLATION COMMANDS WILL BE IGNORED,
R0277    IN WHICH CASE THE ASTRONAUT SHOULD SWITCH TO BD ROLL.
R0278       IF BDROLL IS SELECTED, Z-TRANSLATIONS MAY BE SATISFIED SIMULTANEOUSLY PROVIDED THAT THERE ARE NO BD QUAD
R0280    FAILURES. IF THERE ARE BD FAILURES, Z-TRANSLATION COMMANDS WILL BE IGNORED, IN WHICH CASE THE ASTRONAUT SHOULD
R0282    SWITCH TO AC ROLL.
R0283       NOTE THAT IF ONE QUAD FAILS (E.G. B FAILED), Z-TRANSLATION IS STILL POSSIBLE AND THAT THE UNDESIREABLE ROLL
R0285    INTRODUCED BY THIS TRANSLATION WILL BE COMPENSATED BY THE TWO AC ROLL JETS ACTUATED BY THE AUTOPILOT LOGIC.

R0287            WORD MAKE UP....RTABLE

R0288       TWO WORDS, CORRESPONDING TO AC OR BD ROLL SELECTION, HAVE BEEN COMBINED INTO ONE TABLE.  THE WORD CORRESPOND-
R0290    ING TO AC ROLL HAS THE FOLLOWING INTERPRETATION..
R0291       BITS 9,10,11 ARE CODED TO GIVE THE NET ROLL TORQUE FOR THE WORD SELECTED. THE CODING IS..
R0293                        BIT NO.  11 10 9    NO. OF ROLL JETS

R0294                                 0  0  0          -2
R0295                                 0  0  1          -1
R0296                                 0  1  0           0
R0297                                 0  1  1          +1
R0298                                 1  0  0          +2

R0299       THIS WORD MAY THEN BE ADDED TO THE WORD SELECTED FROM THE YZ-TRANSLATION TABLE, WHICH HAS THE SAME TYPE OF
R0301    CODING AS ABOVE, AND THE NET ROLL DETERMINED BY SHIFTING THE RESULTANT WORD RIGHT 8 PLACES AND SUBTRACTING FOUR.

R0303       THE WORD CORRESPONDING TO BD ROLL HAS A SIMILIAR INTERPRETATION, EXCEPT THAT BITS 12, 13, 14 ARE CODED
R0305    (AS ABOVE) TO GIVE THE NET ROLL TORQUE.


A0306                                                                    ROLL   TRANS     QUADFAIL   BIAS

 0307          17,3157   11000 1   RTABLE   OCT   11000                  0                            0
 0308          17,3160   22125 1            OCT   22125                  +                            0
 0309          17,3161   00252 1            OCT   00252                  -                            0
 0310          17,3162   11231 1            OCT   11231                  0      +Y(+Z)                3
 0311          17,3163   15421 1            OCT   15421                  +      +Y(+Z)                3
 0312          17,3164   04610 1            OCT   04610                  -      +Y(+Z)                3
 0313          17,3165   11146 1            OCT   11146                  0      -Y(-Z)                6
 0314          17,3166   15504 1            OCT   15504                  +      -Y(-Z)                6
 0315          17,3167   04442 1            OCT   04442                  -      -Y(-Z)                6
 0316          17,3170   11000 1            OCT   11000                  0             A(B)           9
 0317          17,3171   15504 1            OCT   15504                  +             A(B)           9
 0318          17,3172   04610 1            OCT   04610                  -             A(B)           9
 0319          17,3173   11000 1            OCT   11000                  0             C(D)          12
 0320          17,3174   15421 1            OCT   15421                  +             C(D)          12
 0321          17,3175   04442 1            OCT   04442                  -             C(D)          12
```

R0322 RTABLE MASKS -

0323		17,3176	03760 C	ACRJETS	OCT	03760
0324		17,3177	34017 C	BDRJETS	OCT	34017

```
R0325           Y, Z TRANSLATION TABLE

R0326      ONCE AC OR BD ROLL IS SELECTED THE QUAD PAIR WHICH IS NOT BEING USED TO SATISFY THE ROLL COMMANDS MAY BE
R0328  USED TO SATISFY THE REMAINING TRANSLATION COMMANDS.  HOWEVER, WE MUST MAKE SURE THAT ROLL COMMANDS ARE SATISFIED
R0330  WHEN THEY OCCUR.  THEREFORE, THE Y-Z TRANSLATIONS FROM THIS TABLE WILL BE IGNORED IF THE NET ROLL TORQUE OF THE
R0332  COMBINED WORD IS ZERO AND THE ROLL COMMANDS ARE NON-ZERO.  THIS SITUATION WOULD OCCUR, FOR EXAMPLE, IF WE EN-
R0334  COUNTER SIMULTANEOUS +R +Y -Z COMMANDS AND  A QUAD D FAILURE WHILE USING AC FOR ROLL.
R0336      TO FACILITATE THE LOGIC, THE Y-Z TRANSLATION TABLE HAS BEEN CODED IN A MANNER SIMILIAR TO THE  ROLL TABLE
R0338  ABOVE.
R0339      BITS 9,10,11 ARE CODED TO GIVE THE NET ROLL TORQUE INCURRED BY Z-TRANSLATIONS. THE WORD SELECTED CAN THEN BE
R0341  ADDED  TO THE AC-ROLL WORD AND THE RESULTANT ROLL TORQUE DETERMINED FROM THE COMBINED WORD.  SIMILIARLY BITS
R0343  12,13,14 ARE CODED TO GIVE THE NET ROLL TORQUE INCURRED BY Y-TRANSLATIONS WHEN BD-ROLL IS SELECTED.

A0345                                                                TRANSLATION     QUADFAIL     BIAS

 0346                    17,3200   11000 1  YZTABLE  OCT    11000        0                          0
 0347                    17,3201   11231 1           OCT    11231      +Z(+Y)                       0
 0348                    17,3202   11146 1           OCT    11146      -Z(-Y)                       0
 0349                    17,3203   11000 1           OCT    11000        0          B(A)            3
 0350                    17,3204   04610 1           OCT    04610      +Z(+Y)       B(A)            3
 0351                    17,3205   15504 1           OCT    15504      -Z(-Y)       B(A)            3
 0352                    17,3206   11000 1           OCT    11000        0          D(C)            6
 0353                    17,3207   15421 1           OCT    15421      +Z(+Y)       D(C)            6
 0354                    17,3210   04442 1           OCT    04442      -Z(-Y)       D(C)            6

R0355           Y2-TABLE MASKS-

 0356                    17,3211   03417 0  BDZJETS  OCT    03417
 0357                    17,3212   34360 0  ACYJETS  OCT    34360

R0358           ADDITIONAL CONSTANTS

 0359  REF   4  LAST  911      7715              =-2       =      NEG2
 0360  REF   1                6061              =-4       =      NEG4
```

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P0361 CALCULATION OF JET ON-TIMES

R0362 THE ROTATION COMMANDS (TAU:S), WHICH WERE DETERMINED FROM THE JET SWITCHING LOGIC ON THE BASIS OF SINGLE JET
R0364 OPERATION, MUST NOW BE UPDATED BY THE ACTUAL NUMBER OF JETS TO BE USED IN SATISFYING THESE COMMANDS. TAU MUST
R0366 ALSO BE DECREMENTED ACCORDING TO THE EXPECTED TORQUE GENERATED BY THE NEW COMMANDS ACTING OVER THE NEXT T5 INT-
R0368 ERVAL.
R0369 IN ORDER TO MAINTAIN ACCURATE KNOWLEDGE OF VEHICLE ANGULAR RATES, WE MUST ALSO PROVIDE EXPECTED FIRING TIMES
R0371 (DFT:S, ALSO IN TERMS OF 1-JET OPERATION) FOR THE RATE FILTER.
R0372 NOTE THAT TRANSLATIONS CAN PRODUCE ROTATIONS EVEN THOUGH NO ROTATIONS WERE CALLED FOR. NEVERTHELESS, WE MUST
R0374 UPDATE DFT.
R0375 WHEN THE ROTATIONS HAVE FINISHED, WE MUST PROVIDE CHANNEL INFORMATION TO THE T6 PROGRAM TO CONTINUE ON WITH
R0377 THE TRANSLATIONS. THIS WILL BE DONE IN THE NEXT SECTION. HOWEVER, TO INSURE THAT JETS ARE NOT FIRED FOR LESS
R0379 THAN A MINIMUM IMPULSE (14MS), ALL JET CHANNEL COMMANDS WILL BE HELD FIXED FROM THE START OF THE T5 PROGRAM FOR
R0381 ATLEAST 14MS UNTIL THE INITIALIZATION OF NEW COMMANDS. MOREOVER, A 14MS ON-TIME WILL BE ADDED TO ANY ROTATIONAL
R0383 COMMANDS GENERATED BY THE MANUAL CONTROLS OR THE JET SWITCHING LOGIC, AND ALL TRANSLATION COMMANDS WILL BE
R0385 ACTIVE FOR ATLEAST ONE CYCLE OF THE T5 PROGRAM (.1SEC)

R0386 PITCH JET ON-TIME CALCULATION

```
 0387  REF   6  LAST 1008   17,3213  11'562 0  PITCHTIM CCS    TAU1
 0388  REF   1              17,3214  1 3223 0            TCF    PTAUPOS
 0389                       17,3215  1 3217 1            TCF    +2
 0390  REF   1              17,3216  1 3221 1            TCF    PTAUNEG
 0391  REF   2  LAST  105   17,3217  55'550 1            TS     DFT1          NO PITCH ROTATION
 0392  REF   1              17,3220  1 3421 1            TCF    PBYPASS       COMMANDS

 0393  REF   3  LAST 1009   17,3221  4 1523 0  PTAUNEG   CS     NPJETS
 0394  REF   4  LAST 1018   17,3222  55'523 0            TS     NPJETS
 0395  REF   7  LAST 1018   17,3223  3 1562 1  PTAUPOS   CA     TAU1
 0396                       17,3224  0 0006 1            EXTEND
 0397  REF   5  LAST 1018   17,3225  5 1523 1            INDEX  NPJETS
 0398  REF   1              17,3226  7 3402 0            MP     NJET
 0399  REF   3  LAST  984   17,3227  55'461 1            TS     BLAST1
 0400  REF   1              17,3230  6 3335 1            AD     =-.1SEC
 0401                       17,3231  0 0006 1            EXTEND
 0402  REF   1              17,3232  6 3243 1            BZMF   AD14MSP
 0403  REF   6  LAST 1018   17,3233  51'523 1            INDEX  NPJETS
 0404  REF   1              17,3234  3 3336 1            CA     DFTMAX        THE PITCH ON-TIME IS GREATER THAN .1 SEC
 0405  REF   3  LAST 1018   17,3235  55'550 1            TS     DFT1
 0406                       17,3236  4 0000 0            COM
 0407  REF   8  LAST 1018   17,3237  27'562 0            ADS    TAU1          UPDATE TAU1
 0408  REF   1              17,3240  3 3337 0            CAF    =+.1SEC       LIMIT THE LENGTH OF PITCH ROTATION
 0409  REF   4  LAST 1018   17,3241  55'461 1            TS     BLAST1        COMMANDS TO 0.1 SEC SO THAT ONLY
 0410  REF   1              17,3242  1 3406 1            TCF    ASMBLWP       X-TRANSLATIONS WILL CONTINUE ON SWITCH
A0411                                                                         OVER TO TVC
 0412  REF   5  LAST 1018   17,3243  4 1461 1  AD14MSP   CS     BLAST1        SEE IF JET ON TIME LESS THAN
 0413  REF   2  LAST 1007   17,3244  6 3342 1            AD     =14MS         MINIMUM IMPULSE TIME
 0414                       17,3245  0 0006 1            EXTEND
 0415  REF   1              17,3246  6 3251 1            BZMF   PBLASTOK      IF SO LIMIT MINIMUM ON TIME TO 14 MS
 0416  REF   3  LAST 1018   17,3247  3 3342 1            CAF    =14MS
```

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```
0417   REF   6  LAST 1018   17,3250  55'461 1            TS      BLAST1
0418   REF   7  LAST 1019   17,3251  3 1461 C  PBLASTOK  CA      BLAST1
0419                        17,3252  0 0006 1            EXTEND                THE PITCH COMMANDS WILL BE COMPLETED
0420   REF   7  LAST 1018   17,3253  7 1523 0            MP      NPJETS        WITHIN THE TS-CYCLE TIME
0421   REF   4  LAST 1018   17,3254  23'550 0            LXCH    DFT1          FOR USE IN UPDATING RATE FILTER
0422   REF   9  LAST 1018   17,3255  55'562 C            TS      TAU1          ZERO TAU1 (ACC CONTAINS ZERO)
0423   REF   2  LAST 1018   17,3256  1 3406 1            TCF     ASMBLWP
```

P0424 YAW JET ON-TIME CALCULATION

```
0425  REF  6  LAST 1009   17,3257  11'563 1  YAWTIME  CCS   TAU2
0426  REF  1              17,3260  1 3267 0           TCF   YTAUPOS
0427                      17,3261  1 3263 1           TCF   +2
0428  REF  1              17,3262  1 3265 1           TCF   YTAUNEG
0429  REF  2  LAST  105   17,3263  55'551 0           TS    DFT2        NO YAW ROTATION COMMANDS
0430  REF  1              17,3264  1 3565 0           TCF   YBYPASS

0431  REF  2  LAST 1010   17,3265  4 1524 1  YTAUNEG  CS    NYJETS
0432  REF  3  LAST 1020   17,3266  55'524 1           TS    NYJETS
0433  REF  7  LAST 1020   17,3267  3 1563 0  YTAUPOS  CA    TAU2
0434                      17,3270  0 0006 1           EXTEND
0435  REF  4  LAST 1020   17,3271  5 1524 0           INDEX NYJETS
0436  REF  2  LAST 1018   17,3272  7 3402 0           MP    NJET
0437  REF  3  LAST  984   17,3273  55'463 0           TS    BLAST2
0438  REF  2  LAST 1018   17,3274  6 3335 1           AD    =-.1SEC
0439                      17,3275  0 0006 1           EXTEND
0440  REF  1              17,3276  6 3307 0           BZMF  AD14MSY
0441  REF  5  LAST 1020   17,3277  51'524 0           INDEX NYJETS
0442  REF  2  LAST 1018   17,3300  3 3336 1           CA    DFTMAX      YAW COMMANDS WILL LAST LONGER THAN .1SEC
0443  REF  3  LAST 1020   17,3301  55'551 0           TS    DFT2
0444                      17,3302  4 0000 0           COM
0445  REF  8  LAST 1020   17,3303  27'563 1           ADS   TAU2        DECREMENT TAU2
0446  REF  2  LAST 1018   17,3304  3 3337 0           CAF   =+.1SEC     LIMIT THE LENGTH OF YAW ROTATION COMMAND
0447  REF  4  LAST 1020   17,3305  55'463 0           TS    BLAST2      TO 0.1 SEC SO THAT ONLY X-TRANSLATION
0448  REF  1              17,3306  1 3552 1           TCF   ASMBLWY     WILL CONTINUE ON SWITCH OVER TO TVC

0449  REF  5  LAST 1020   17,3307  4 1463 0  AD14MSY  CS    BLAST2      SEE IF JET ON-TIME LESS THAN
0450  REF  4  LAST 1018   17,3310  6 3342 1           AD    =14MS       MINIMUM IMPULSE TIME
0451                      17,3311  0 0006 1           EXTEND
0452  REF  1              17,3312  6 3315 0           BZMF  YBLASTOK    IF SO, LIMIT MINIMUM ON-TIME TO 14 MS
0453  REF  5  LAST 1020   17,3313  3 3342 1           CAF   =14MS
0454  REF  6  LAST 1020   17,3314  55'463 0           TS    BLAST2
0455  REF  7  LAST 1020   17,3315  3 1463 1  YBLASTOK CA    BLAST2      YAW COMMANDS WILL BE COMPLETED WITHIN
0456                      17,3316  0 0006 1           EXTEND            THE T5CYCLE TIME
0457  REF  6  LAST 1020   17,3317  7 1524 1           MP    NYJETS
0458  REF  4  LAST 1020   17,3320  23'551 1           LXCH  DFT2
0459  REF  9  LAST 1020   17,3321  55'563 1           TS    TAU2        ZERO TAU2
0460  REF  2  LAST 1020   17,3322  1 3552 1           TCF   ASMBLWY
```

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P0461 ROLL ON-TIME CALCULATION-

0462	REF	9	LAST 1013	17,3323	11'561 C	ROLLTIME	CCS	TAU	
0463	REF	1		17,3324	1 3343 1		TCF	RBLAST	
0464				17,3325	1 3327 C		TCF	+2	
0465	REF	2	LAST 1021	17,3326	1 3343 1		TCF	RBLAST	
0466	REF	6	LAST 1014	17,3327	51'522 C		INDEX	NRJETS	
0467	REF	3	LAST 1020	17,3330	3 3336 1		CA	DFTMAX	UPDATE DFT EVEN THO NO ROLL COMMANDS ARE
0468	REF	3	LAST 974	17,3331	55'547 1		TS	DFT	PRESENT
0469	REF	1		17,3332	1 3545 1		TCF	RBYPASS	
0470				17,3333	77037 0		DEC	-480	= -.3SEC
0471				17,3334	77277 0		DEC	-320	= -.2SEC
0472				17,3335	77537 0	=-.1SEC	DEC	-160	= -.1SEC
0473				17,3336	00000 1	DFTMAX	DEC	0	0
0474				17,3337	00240 1	=+.1SEC	DEC	160	= +.1SEC
0475				17,3340	00500 1		DEC	320	= +.2SEC
0476				17,3341	00740 1		DEC	480	= +.3SEC
0477				17,3342	00027 1	=14MS	DEC	23	=14MS
0478	REF	10	LAST 1021	17,3343	3 1561 1	RBLAST	CA	TAU	
0479				17,3344	0 0006 1		EXTEND		
0480	REF	7	LAST 1021	17,3345	5 1522 C		INDEX	NRJETS	
0481	REF	3	LAST 1020	17,3346	7 3402 C		MP	NJET	
0482	REF	2	LAST 99	17,3347	55'457 1		TS	BLAST	BLAST IS AN INTERMEDIATE VARIABLE
A0483									USED IN DETERMINING THE JET ON-TIMES
0484	REF	3	LAST 1020	17,3350	6 3335 1		AD	=-.1SEC	
0485				17,3351	0 0006 1		EXTEND		
0486	REF	1		17,3352	6 3363 1		BZMF	AD14MSR	
0487	REF	8	LAST 1021	17,3353	51'522 C		INDEX	NRJETS	THE ROLL ROTATION WILL LAST LONGER
0488	REF	4	LAST 1021	17,3354	3 3336 1		CA	DFTMAX	THAN THE T5 CYCLE TIME
0489	REF	4	LAST 1021	17,3355	55'547 1		TS	DFT	
0490				17,3356	4 0000 C		COM		
0491	REF	11	LAST 1021	17,3357	27'561 C		ADS	TAU	
0492	REF	3	LAST 1020	17,3360	3 3337 C		CAF	=+.1SEC	LIMIT THE LENGTH OF ROLL ROTATION
0493	REF	3	LAST 1021	17,3361	55'457 1		TS	BLAST	COMMANDS TO 0.1 SEC SO THAT ONLY Y-Z
0494	REF	1		17,3362	1 3426 C		TCF	ASMBLWR	TRANSLATION COMMANDS CONTINUE
0495	REF	4	LAST 1021	17,3363	4 1457 1	AD14MSR	CS	BLAST	SEE IF THE JET ON-TIME LESS THAN
0496	REF	6	LAST 1020	17,3364	6 3342 1		AD	=14MS	MINIMUM IMPULSE TIME
0497				17,3365	0 0006 1		EXTEND		
0498	REF	1		17,3366	6 3371 1		BZMF	RBLASTOK	
0499	REF	7	LAST 1021	17,3367	3 3342 1		CAF	=14MS	IF SO, LIMIT MINIMUM ON-TIME TO 14 MS
0500	REF	5	LAST 1021	17,3370	55'457 1		TS	BLAST	
0501	REF	6	LAST 1021	17,3371	3 1457 C	RBLASTOK	CA	BLAST	
0502				17,3372	0 0006 1		EXTEND		
0503	REF	9	LAST 1021	17,3373	7 1522 1		MP	NRJETS	
0504	REF	5	LAST 1021	17,3374	23'547 C		LXCH	DFT	
0505	REF	12	LAST 1021	17,3375	55'561 C		TS	TAU	ZERO TAU
0506	REF	2	LAST 1021	17,3376	1 3426 C		TCF	ASMBLWR	

0507	17,3377	65252 1		DEC	-.333333	= -1/3
0508	17,3400	57777 1		DEC	-.500000	= -1/2
0509	17,3401	40000 0		DEC	-.999999	= -1 (NEGMAX)
0510	17,3402	00000 1	NJET	DEC	0	
0511	17,3403	37777 1		DEC	.999999	= +1 (POSMAX)
0512	17,3404	20000 0		DEC	.500000	= +1/2
0513	17,3405	12525 0		DEC	.333333	= +1/3

```
P0514      WHEN THE ROTATION COMMANDS ARE COMPLETED, IT IS NECESSARY TO REPLACE THESE COMMANDS BY NEW COMMANDS WHICH
R0516   CONTINUE ON WITH THE TRANSLATIONS IF ANY ARE PRESENT.
R0517      IN THIS SECTION THESE NEW COMMANDS ARE GENERATED AND STORED FOR REPLACEMENT OF THE CHANNEL COMMANDS WHEN THE
R0519   CORRESPONDING ROTATIONS ARE COMPLETED.

R0520   GENERATION OF THE SECOND PITCH(X-TRANS) WORD...PWORD2

 0521   REF    8  LAST 1013   17,3406  11'626 C  ASMBLWP  CCS     RACFAIL
 0522   REF    1               17,3407  1 3415 C           TCF     FPX2          IF FAILURE ON AC IGNORE X-TRANSLATION
 0523                          17,3410  1 3412 1           TCF     +2
 0524   REF    2  LAST 1023   17,3411  1 3415 C           TCF     FPX2
 0525   REF    7  LAST 1009   17,3412  51'513 1           INDEX   XNDX1
 0526   REF    5  LAST 1013   17,3413  3 2707 C           CA      XLNNDX
 0527   REF  236  LAST 1013   17,3414  50 000 1           INDEX   A
 0528   REF    3  LAST 1010   17,3415  3 2743 C  FPX2     CA      PYTABLE
 0529   REF    2  LAST 1009   17,3416  7 2762 1           MASK    PJETS
 0530   REF    2  LAST   99   17,3417  55'454 1           TS      PWORD2
 0531   REF    1               17,3420  1 3257 C           TCF     YAWTIME

 0532   REF    3  LAST 1009   17,3421  3 1453 1  PBYPASS  CA      PWORD1        THE T6 PROGRAM WILL LOAD PWORD2
 0533   REF    3  LAST 1023   17,3422  55'454 1           TS      PWORD2        UPON ENTRY
 0534   REF  182  LAST 1004   17,3423  3 4714 1           CAF     ZERO
 0535   REF    8  LAST 1019   17,3424  55'461 1           TS      BLAST1        THERE IS NO PWORD2
 0536   REF    2  LAST 1023   17,3425  1 3257 C           TCF     YAWTIME
```

P0537 GENERATION OF THE SECOND ROLL (Y,Z) WORD (RWORD2)

0538	REF	8	LAST	1013	17,3426	11'515	0	ASMBLWR	CCS	YNDX	CHECK FOR Y-TRANS
0539	REF	1			17,3427	1 3437	0		TCF	ACBD2Y	
0540	REF	183	LAST	1023	17,3430	3 4714	1	NO2Y	CAF	ZERO	
0541	REF	2	LAST	99	17,3431	55'452	1		TS	RWORD2	
0542	REF	7	LAST	1013	17,3432	11'516	0		CCS	ZNDX	CHECK FOR Z-TRANS
0543	REF	1			17,3433	1 3502	1		TCF	ACBD2Z	
0544	REF	184	LAST	1024	17,3434	3 4714	1	NO2Z	CAF	ZERO	
0545	REF	3	LAST	1024	17,3435	27'452	1		ADS	RWORD2	
0546	REF	1			17,3436	1 3213	0		TCF	PITCHTIM	RWORD2 ASSEMBLED
0547	REF	4	LAST	1011	17,3437	11'630	1	ACBD2Y	CCS	ACORBD	
0548	REF	1			17,3440	1 3455	1		TCF	AC2Y	CAN DO Y-TRANS
0549	REF	2	LAST	1024	17,3441	1 3455	1		TCF	AC2Y	
0550					17,3442	1 3443	0		TCF	+1	USING AC FOR ROLL
0551	REF	9	LAST	1023	17,3443	11'626	0		CCS	RACFAIL	
0552	REF	1			17,3444	1 3430	1		TCF	NO2Y	USING AC AND AC HAS FAILED
0553					17,3445	1 3447	1		TCF	+2	
0554	REF	2	LAST	1024	17,3446	1 3430	1		TCF	NO2Y	DITTO
0555	REF	9	LAST	1024	17,3447	51'515	1		INDEX	YNDX	NO FAILURES, CAN DO Y
0556	REF	6	LAST	1023	17,3450	3 2707	0		CA	XLNNDX	
0557	REF	237	LAST	1023	17,3451	50 000	1		INDEX	A	
0558	REF	3	LAST	1013	17,3452	3 3157	1		CA	RTABLE	
0559	REF	2	LAST	1011	17,3453	7 3176	0		MASK	ACRJETS	
0560	REF	3	LAST	1024	17,3454	1 3431	0		TCF	NO2Y +1	
0561	REF	10	LAST	1024	17,3455	11'626	0	AC2Y	CCS	RACFAIL	
0562	REF	36	LAST	1013	17,3456	3 6214	0		CAF	THREE	
0563					17,3457	1 3461	0		TCF	+2	
0564	REF	33	LAST	1013	17,3460	3 6211	0		CAF	SIX	
0565	REF	10	LAST	1024	17,3461	51'515	1		INDEX	YNDX	
0566	REF	3	LAST	1013	17,3462	6 3020	0		AD	XLN1NDX	
0567	REF	238	LAST	1024	17,3463	50 000	1		INDEX	A	
0568	REF	3	LAST	1013	17,3464	3 3200	0		CA	YZTABLE	
0569	REF	2	LAST	1013	17,3465	7 3212	1		MASK	ACYJETS	
0570	REF	4	LAST	1024	17,3466	55'452	1		TS	RWORD2	
0571					17,3467	0 0006	1		EXTEND		
0572	REF	37	LAST	1014	17,3470	7 4707	1		MP	BIT4	
0573	REF	3	LAST	1014	17,3471	6 7715	0		AD	=-2	
0574	REF	10	LAST	1021	17,3472	55'522	1		TS	NRJETS	
0575	REF	7	LAST	1021	17,3473	4 1457	1		CS	BLAST	
0576	REF	4	LAST	1021	17,3474	6 3337	0		AD	=+.1SEC	
0577					17,3475	0 0006	1		EXTEND		
0578	REF	11	LAST	1024	17,3476	7 1522	1		MP	NRJETS	
0579	REF	130	LAST	993	17,3477	3 0001	0		CA	L	
0580	REF	6	LAST	1021	17,3500	27'547	1		ADS	DFT	
0581	REF	4	LAST	1024	17,3501	1 3432	0		TCF	NO2Y +2	

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0582  REF   5  LAST 1024   17,3502  11'630 1  ACBDZZ  CCS   ACORBD
0583  REF   1              17,3503  1 3533 C          TCF   BDFZZ     USING BD-ROLL
0584  REF   2  LAST 1025   17,3504  1 3533 C          TCF   BDFZZ     MUST CHECK FOR BD FAILURES
0585                       17,3505  1 3506 C          TCF   +1
0586  REF   8  LAST 1013   17,3506  11'627 1          CCS   RBDFAIL   USING AC FOR ROLL, CAN DO Z-TRANS
0587  REF  37  LAST 1024   17,3507  3 6214 C          CAF   THREE
0588                       17,3510  1 3512 C          TCF   +2
0589  REF  34  LAST 1024   17,3511  3 6211 C          CAF   SIX
0590  REF   8  LAST 1024   17,3512  51'516 1          INDEX ZNDX
0591  REF   4  LAST 1024   17,3513  6 3020 C          AD    XLN1ADX
0592  REF 239  LAST 1024   17,3514  5C 000 1          INDEX A
0593  REF   4  LAST 1024   17,3515  3 3200 C          CA    YZTABLE
0594  REF   2  LAST 1012   17,3516  7 3211 1          MASK  BDZJETS
0595  REF   5  LAST 1024   17,3517  27'452 1          ADS   RWORD2
0596                       17,3520  0 0006 1          EXTEND
0597  REF  46  LAST 1012   17,3521  7 4704 1          MP    BIT7
0598  REF   4  LAST 1024   17,3522  6 7715 C          AD    =-2
0599  REF  12  LAST 1024   17,3523  55'522 1          TS    NRJETS
0600  REF   8  LAST 1024   17,3524  4 1457 1          CS    BLAST
0601  REF   5  LAST 1024   17,3525  6 3337 C          AD    =+.1SEC
0602                       17,3526  0 0006 1          EXTEND
0603  REF  13  LAST 1025   17,3527  7 1522 1          MP    NRJETS
0604  REF 131  LAST 1024   17,3530  3 0001 C          CA    L
0605  REF   7  LAST 1024   17,3531  27'547 1          ADS   DFT
0606  REF   2  LAST 1024   17,3532  1 3213 C          TCF   PITCHTIM

0607  REF   9  LAST 1025   17,3533  11'627 1  BDF2Z   CCS   RBDFAIL
0608  REF   1              17,3534  1 3434 C          TCF   NO2Z     USING BD-ROLL AND BD HAS FAILED
0609                       17,3535  1 3537 1          TCF   +2
0610  REF   2  LAST 1025   17,3536  1 3434 C          TCF   NO2Z     DITTO
0611  REF   9  LAST 1025   17,3537  51'516 1          INDEX ZNDX
0612  REF   7  LAST 1024   17,3540  3 2707 C          CA    XLNNDX
0613  REF 240  LAST 1025   17,3541  50 000 1          INDEX A
0614  REF   4  LAST 1024   17,3542  3 3157 1          CA    RTABLE
0615  REF   2  LAST 1013   17,3543  7 3177 1          MASK  BDRJETS
0616  REF   3  LAST 1025   17,3544  1 3435 1          TCF   NO2Z +1

0617  REF  11  LAST 1014   17,3545  3 1451 C  RBYPASS  CA    RWORD1
0618  REF   6  LAST 1025   17,3546  55'452 1          TS    RWORD2
0619  REF 185  LAST 1024   17,3547  3 4714 1          CAF   ZERO
0620  REF   9  LAST 1025   17,3550  55'457 1          TS    BLAST
0621  REF   3  LAST 1025   17,3551  1 3213 C          TCF   PITCHTIM
```

P0622 GENERATION OF THE SECOND YAW (X-TRANS) WORD...YWORD2

```
0623   REF  10  LAST 1025   17,3552  11'627 1  ASMBLWY  CCS     RBDFAIL
0624   REF   1              17,3553  1 3561 1           TCF     FYX2          IF FAILURE ON BD IGNORE X-TRANSLATION
0625                        17,3554  1 3556 C           TCF     +2
0626   REF   2  LAST 1026   17,3555  1 3561 1           TCF     FYX2
0627   REF   6  LAST 1010   17,3556  51'514 C           INDEX   XNDX2
0628   REF   8  LAST 1025   17,3557  3 2707 C           CA      XLNNDX
0629   REF 241  LAST 1025   17,3560  50 000 1           INDEX   A
0630   REF   4  LAST 1023   17,3561  3 2743 C  FYX2     CA      PYTABLE
0631   REF   2  LAST 1010   17,3562  7 2763 C           MASK    YJETS
0632   REF   2  LAST   99   17,3563  55'456 C           TS      YWORD2
0633   REF   1              17,3564  1 3571 0           TCF     T6SETUP

0634   REF   3  LAST 1010   17,3565  3 1455 1  YBYPASS  CA      YWORD1
0635   REF   3  LAST 1026   17,3566  55'456 C           TS      YWORD2
0636   REF 186  LAST 1025   17,3567  3 4714 1           CAF     ZERO
0637   REF   8  LAST 1020   17,3570  55'463 C           TS      BLAST2
```

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R0638            SORT THE JET ON-TIMES

R0639      AT THIS POINT ALL THE CHANNEL COMMANDS AND JET ON-TIMES HAVE BEEN DETERMINED. IN SUMMARY THESE ARE-

R0641            RWORD1
R0642            RWORD2          BLAST

R0643            PWORD1
R0644            PWORD2          BLAST1

R0645            YWORD1
R0646            YWORD2          BLAST2

R0647       IN THIS SECTION THE JET ON-TIMES ARE SORTED AND THE SEQUENCE OF T6 INTERRUPTS IS DETERMINED.  TO FACILITATE
R0649  THE SORTING PROCESS AND THE T6 PROGRAM, THE VARIABLES BLAST, BLAST1, BLAST2, ARE RESERVED AS DOUBLE PRECISION
R0651  WORDS.  THE LOWER PART OF THESE WORDS CONTAIN A BRANCH INDEX ASSOCIATED WITH THE ROTATION AXIS OF THE HIGHER
R0653  ORDER WORD.

 0654  REF 187  LAST 1026   17,3571  3 4714 1  T6SETUP  CAF     ZERO          BRANCH INDEX FOR ROLL
 0655  REF  10  LAST 1025   17,3572  55'460 0            TS      BLAST +1
 0656  REF  14  LAST  998   17,3573  3 4710 0            CAF     FOUR          BRANCH INDEX FOR PITCH
 0657  REF   9  LAST 1023   17,3574  55'462 1            TS      BLAST1 +1
 0658  REF   8  LAST  984   17,3575  3 4717 1            CAF     ELEVEN        BRANCH INDEX FOR YAW
 0659  REF   9  LAST 1026   17,3576  55'464 1            TS      BLAST2 +1

 0660  REF  11  LAST 1027   17,3577  4 1457 1            CS      BLAST
 0661  REF  10  LAST 1027   17,3600  6 1461 0            AD      BLAST1
 0662                       17,3601  0 0006 1            EXTEND
 0663  REF   1              17,3602  6 3626 0            BZMF    DXCHT12       T1 GR T2
 0664  REF  11  LAST 1027   17,3603  4 1461 1  CHECKT23  CS      BLAST1
 0665  REF  10  LAST 1027   17,3604  6 1463 1            AD      BLAST2
 0666                       17,3605  0 0006 1            EXTEND
 0667  REF   1              17,3606  6 3632 0            BZMF    DXCHT23
 0668  REF  12  LAST 1027   17,3607  4 1461 1  CALCDT6   CS      BLAST1
 0669  REF  11  LAST 1027   17,3610  27'463 0            ADS     BLAST2
 0670  REF  12  LAST 1027   17,3611  4 1457 1            CS      BLAST
 0671  REF  13  LAST 1027   17,3612  27'461 1            ADS     BLAST1        END OF SORTING PROCEDURE
 0672                       17,3613  0 0006 1            EXTEND                RESET T5LOC TO BEGIN PHASE1
 0673  REF   1              17,3614  3 3625 0            DCA     RCS2CADR
 0674  REF  21  LAST 1004   17,3615  53'313 0            DXCH    T5LOC
 0675  REF  70  LAST  984   17,3616  4 4712 0  ENDJETS   CS      BIT1          RESET BIT1 FOR INITIALIZATION OF
 0676  REF  47  LAST 1001   17,3617  7 1501 0            MASK    RCSFLAGS      T6 PROGRAM
 0677  REF  48  LAST 1027   17,3620  55'501 0            TS      RCSFLAGS
 0678  REF 188  LAST 1027   17,3621  4 4714 0            CS      ZERO          RESET T5PHASE FOR PHASE1
 0679  REF  10  LAST  990   17,3622  55'465 0            TS      T5PHASE
 0680  REF  40  LAST 1004   17,3623  1 5222 1            TCF     RESUME        RESUME INTERRUPTED PROGRAM


 0681  REF  38  LAST 1007   E6,1510                     EBANK=  KMPAC
 0682  REF   5  LAST  970   17,3624    02106 1  RCS2CADR 2CADR   RCSATT
 0682                       17,3625    42066 1
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0683   REF  13  LAST 1027   17,3626  53'460 C  DXCHT12  DXCH   BLAST
0684   REF  14  LAST 1027   17,3627  53'462 1            DXCH   BLAST1
0685   REF  14  LAST 1028   17,3630  53'460 C            DXCH   BLAST
0686   REF   1              17,3631  1 3603 C            TCF    CHECKT23

0687   REF  15  LAST 1028   17,3632  53'462 1  DXCHT23   DXCH   BLAST1
0688   REF  12  LAST 1027   17,3633  53'464 1            DXCH   BLAST2
0689   REF  16  LAST 1028   17,3634  53'462 1            DXCH   BLAST1
0690   REF  15  LAST 1028   17,3635  4 1457 1            CS     BLAST
0691   REF  17  LAST 1028   17,3636  6 1461 C            AD     BLAST1
0692                        17,3637  0 0006 1            EXTEND
0693                        17,3640  6 3642 1            BZMF   +2
0694   REF   1              17,3641  1 3607 1            TCF    CALCDT6
0695   REF  16  LAST 1028   17,3642  53'460 C            DXCH   BLAST
0696   REF  18  LAST 1028   17,3643  53'462 1            DXCH   BLAST1
0697   REF  17  LAST 1028   17,3644  53'460 C            DXCH   BLAST
0698   REF   2  LAST 1028   17,3645  1 3607 1            TCF    CALCDT6
```

P0699 T6 PROGRAM AND CHANNEL SETUP

```
0700                              21,3751                          BANK   21
0701   REF    1                   17,2000                          SETLOC DAPS5
0702                              17,3646                          BANK

0703   REF   19  LAST 1007        17,3646  22 016 0  T6START LXCH   BANKRUPT
0704                              17,3647  0 0006 1         EXTEND
0705   REF   15  LAST 1007        17,3650  22 012 1         QXCH   QRUPT
0706   REF    5  LAST 1007        17,3651  10 031 1         CCS    TIME6          CHECK TO SEE IF TIME6 WAS RESET
0707   REF   41  LAST 1027        17,3652  1 5222 1         TCF    RESUME         AFTER T6RUPT OCCURED(IN T5RUPT)
0708                              17,3653  1 3655 0         TCF    +2             IF SO WAIT FOR NEXT T6RUPT BEFORE
0709   REF   42  LAST 1029        17,3654  1 5222 1         TCF    RESUME         TAKING ACTION

0710   REF   49  LAST 1027        17,3655  4 1501 0         CS     RCSFLAGS
0711   REF   71  LAST 1027        17,3656  7 4712 0         MASK   BIT1           IF BIT1 IS 0 RESET TO 1
0712                              17,3657  0 0006 1         EXTEND                AND INITIALIZE CHANNEL
0713   REF    1                   17,3660  1 3671 0         BZF    T6RUPTCR
0714   REF   50  LAST 1029        17,3661  27'501 0         ADS    RCSFLAGS
0715   REF   12  LAST 1025        17,3662  3 1451 0         CA     RWORD1
0716                              17,3663  0 0006 1         EXTEND                INITIALIZE CHANNELS 5,6 WITH WORD1
0717   REF    7  LAST  956        17,3664  01 006 0         WRITE  CHAN6
0718   REF    4  LAST 1023        17,3665  3 1453 1         CA     PWORD1
0719   REF    4  LAST 1026        17,3666  6 1455 1         AD     YWORD1
0720                              17,3667  0 0006 1         EXTEND
0721   REF    3  LAST  649        17,3670  01 005 0         WRITE  CHAN5

0722   REF   18  LAST 1028        17,3671  11'457 1  T6RUPTOR CCS    BLAST
0723   REF    1                   17,3672  1 3751 0         TCF    ZBLAST         ZERO BLAST1
0724   REF    1                   17,3673  1 3710 0         TCF    REPLACE        REPLACE WORD1
0725                              17,3674  1 3676 1         TCF    +2
0726   REF    2  LAST 1029        17,3675  1 3710 0         TCF    REPLACE
0727   REF   19  LAST 1028        17,3676  11'461 1  T6L1    CCS    BLAST1
0728   REF    1                   17,3677  1 3754 0         TCF    ZBLAST1
0729   REF    1                   17,3700  1 3715 0         TCF    REPLACE1
0730                              17,3701  1 3703 1         TCF    +2
0731   REF    2  LAST 1029        17,3702  1 3715 0         TCF    REPLACE1
0732   REF   13  LAST 1028        17,3703  11'463 0  T6L2    CCS    BLAST2
0733   REF    1                   17,3704  1 3757 0         TCF    ZBLAST2
0734   REF    1                   17,3705  1 3722 1         TCF    REPLACE2
0735   REF   43  LAST 1029        17,3706  1 5222 1         TCF    RESUME
0736   REF    2  LAST 1029        17,3707  1 3722 1         TCF    REPLACE2

0737   REF   19  LAST 1029        17,3710  51'460 1  REPLACE INDEX  BLAST +1
0738   REF    1                   17,3711  0 3727 0         TC     REPLACER
0739   REF  110  LAST 1011        17,3712  4 4712 0         CS     ONE
0740   REF   20  LAST 1029        17,3713  55'457 1         TS     BLAST
0741   REF    1                   17,3714  1 3676 1         TCF    T6L1

0742   REF   20  LAST 1029        17,3715  51'462 0  REPLACE1 INDEX  BLAST1 +1
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L JET SELECTION LOGIC

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0743   REF   2  LAST 1029   17,3716  0 3727 C            TC      REPLACER
0744   REF 111  LAST 1029   17,3717  4 4712 C            CS      ONE
0745   REF  21  LAST 1029   17,3720  55'461 1            TS      BLAST1
0746   REF   1              17,3721  1 3703 1            TCF     T6L2

0747   REF  14  LAST 1029   17,3722  51'464 C  REPLACE2  INDEX   BLAST2 +1
0748   REF   3  LAST 1030   17,3723  0 3727 C            TC      REPLACER
0749   REF 112  LAST 1030   17,3724  4 4712 C            CS      ONE
0750   REF  15  LAST 1030   17,3725  55'463 C            TS      BLAST2
0751   REF  44  LAST 1029   17,3726  1 5222 1            TCF     RESUME

0752   REF   7  LAST 1025   17,3727  3 1452 C  REPLACER  CA      RWORD2
0753                        17,3730  0 0006 1            EXTEND                  INITIALIZE CHANNELS 5,6 WITH WORD 2
0754   REF   8  LAST 1029   17,3731  01 006 C            WRITE   CHAN6
0755   REF 199  LAST  989   17,3732  0 0002 C            TC      Q

0756   REF   3  LAST 1026   17,3733  3 2763 1  REPLACEP  CA      YJETS
0757                        17,3734  0 0006 1            EXTEND
0758   REF   4  LAST 1029   17,3735  02 005 0            RAND    CHAN5
0759   REF   4  LAST 1023   17,3736  6 1454 C            AD      PWORD2
0760                        17,3737  0 0006 1            EXTEND
0761   REF   5  LAST 1030   17,3740  01 005 C            WRITE   CHAN5
0762   REF 200  LAST 1030   17,3741  0 0002 C            TC      Q

0763   REF   3  LAST 1023   17,3742  3 2762 C  REPLACEY  CA      PJETS
0764                        17,3743  0 0006 1            EXTEND
0765   REF   6  LAST 1030   17,3744  02 005 C            RAND    CHAN5
0766   REF   4  LAST 1026   17,3745  6 1456 1            AD      YWORD2
0767                        17,3746  0 0006 1            EXTEND
0768   REF   7  LAST 1030   17,3747  01 005 C            WRITE   CHAN5
0769   REF 201  LAST 1030   17,3750  0 0002 C            TC      Q

0770   REF 189  LAST 1027   17,3751  3 4714 1  ZBLAST    CAF     ZERO
0771   REF  21  LAST 1029   17,3752  57'457 C            XCH     BLAST
0772   REF   1              17,3753  1 3761 C            TCF     ENABT6
0773   REF 190  LAST 1030   17,3754  3 4714 1  ZBLAST1   CAF     ZERO
0774   REF  22  LAST 1030   17,3755  57'461 C            XCH     BLAST1
0775   REF   2  LAST 1030   17,3756  1 3761 C            TCF     ENABT6
0776   REF 191  LAST 1030   17,3757  3 4714 1  ZBLAST2   CAF     ZERO
0777   REF  16  LAST 1030   17,3760  57'463 1            XCH     BLAST2
0778   REF   6  LAST 1029   17,3761  54 031 1  ENABT6    TS      TIME6
0779   REF  10  LAST 1007   17,3762  3 4674 C            CAF     NEGMAX
0780                        17,3763  0 0006 1            EXTEND
0781   REF  11  LAST 1007   17,3764  05 013 C            WOR     CHAN13          ENABLE T6RUPT
0782   REF  45  LAST 1030   17,3765  1 5222 1            TCF     RESUME

R0783                  END OF T6 INTERRUPT

0784                        17,3766           ENDSLECT EQUALS
```

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```
R0001   SUBROUTINE TO READ GYMBAL ANGLES AND FORM DIFFERENCES.  GIMBAL ANGLES ARE SAVED IN 2S COMPLEMENT, BUT THE
R0003   DIFFERENCES ARE IN 1S COMP.     ENTER AND READ ANGLES EACH .1 SEC.

R0004           CM/DSTBY = 1  FOR DAP OPERATION
R0005           CM/DSTBY = 0 TO TERMINATE DAP OPERATION.

 0006                           15,2454                          BANK   15

 0007   REF   1                 15,2000                          SETLOC ETRYDAP
 0008                           15,2454                          BANK

 0009   REF   1                                                  COUNT  15/DAPEN

 0010   REF  29  LAST  839      E6,1661                          EBANK= AOG

 0011   REF   6  LAST  957      15,2454  3 4377 0  READGYMB CA     TEN            KEEP RESTART DT GOING RELATIVE TO
 0012   REF   5  LAST  776      15,2455  27'725 1         ADS    CM/GYMDT       PIPTIME. (GROUP 6)

A0013                                                             IF A RESTART OCCURS, SKIP PRESENT CYCLE. THE
A0014                                                             PHASCHNG PROTECTION IS IN CM/DAPIC.

 0015   REF  43  LAST  990      15,2456  3 4705 1         CA     BIT6           CHECK FOR FINE ALIGN MODE OF CDU.
 0016   REF  28  LAST  983      15,2457  7 1321 1         MASK   IMODES33       ( PROTECT AOG/PIP ETC AS WELL AS
 0017                           15,2460  0 0006 1         EXTEND                  GIMBAL DIFFERENCES)
 0018   REF   1                 15,2461  1 2467 1         BZF    READGYM1       OK

 0019   REF  72  LAST 1025      15,2462  4 4712 0         CS     BIT1           NOT IN FINE ALIGN, SO IDLE.
 0020   REF  10  LAST  837      15,2463  7 0102 0         MASK   CM/FLAGS        SET GYMDIFSW =0
 0021   REF  11  LAST 1031      15,2464  54 102 0         TS     CM/FLAGS
 0022   REF   1                 15,2465  0 6000 1         TC     FLUSHJET       QUENCH JETS, SINCE MAY BE A WHILE.
 0023   REF   1                 15,2466  0 2534 1         TC     CM/GYMIC +2

 0024   REF  27  LAST 1005      15,2467  3 0032 0  READGYM1 CA     CDUX
 0025   REF  30  LAST 1031      15,2470  57'661 1         XCH    AOG
 0026                           15,2471  0 0006 1         EXTEND
 0027   REF  31  LAST 1031      15,2472  21'661 0         MSU    AOG            -DELAOG=AOG(N-1) - AOG(N)
 0028   REF   2  LAST  108      15,2473  55'675 0         TS     -DELAOG

 0029   REF  15  LAST  995      15,2474  3 0033 1         CA     CDUY
 0030   REF   2  LAST  108      15,2475  57'662 1         XCH    AIG
 0031                           15,2476  0 0006 1         EXTEND
 0032   REF   3  LAST 1031      15,2477  21'662 0         MSU    AIG
 0033   REF   2  LAST  108      15,2500  55'676 0         TS     -DELAIG

 0034   REF  21  LAST 1005      15,2501  3 0034 0         CA     CDUZ
 0035   REF   3  LAST  775      15,2502  57'663 0         XCH    AMG
 0036                           15,2503  0 0006 1         EXTEND
 0037   REF   4  LAST 1031      15,2504  21'663 1         MSU    AMG
 0038   REF   2  LAST  108      15,2505  55'677 1         TS     -DELAMG
```

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```
0039   REF  12  LAST 1031   15,2506  4 0102 C  DOBRATE? CS     CM/FLAGS      CM/DSTBY=1030 BIT2  GYMDIFSW=1040 BIT1
0040   REF  38  LAST 1025   15,2507  7 6214 1            MASK   THREE
0041   REF 242  LAST 1026   15,2510  5C 000 1            INDEX  A
0042                        15,2511  0 2512 C            TC     +1
0043   REF   1              15,2512  0 2521 C            TC     DOBRATE       OK, GO ON
0044   REF   2  LAST 1031   15,2513  0 2532 1            TC     CM/GYMIC      DONT CALC BODYRATE ON FIRST PASS.
0045                        15,2514  12 515 C            NOOP
0046   REF   2  LAST 1031   15,2515  0 6000 1            TC     FLUSHJET      TURN OFF ALL JETS

0047   REF  89  LAST  841   15,2516  0 5301 C            TC     PHASCHNG
0048                        15,2517   00006 1            OCT    00006         DEACTIVATE CAP GROUP 6.

0049   REF  50  LAST  955   15,2520  0 5213 1            TC     TASKOVER

0050   REF 113  LAST 1030   15,2521  3 4712 1  DOBRATE   CA     ONE           DO BODYRATE
0051   REF   2  LAST  109   15,2522  55'720 1  DOBRATE1  TS     JETEM         SKIP BODYRATE.

0052   REF   7  LAST 1031   15,2523  3 4377 C            CA     TEN           KEEP CDU READ GOING.
0053   REF  45  LAST  943   15,2524  0 5140 1            TC     WAITLIST
0054   REF  32  LAST 1031   E6,1661                      EBANK= AOG
0055   REF   2  LAST  212   15,2525   02454 C            2CADR  READGYMB
0055                        15,2526   32066 C

A0056                                                    DOES NOT PROTECT TEMK, SQ IN SPSIN/COS

0057   REF   3  LAST 1032   15,2527  11'720 1            CCS    JETEM
0058   REF   1              15,2530  0 2556 C            TC     BODYRATE
0059   REF  51  LAST 1032   15,2531  0 5213 1            TC     TASKOVER      SKIP CALC ON INITIAL PASS. (PASSES)

0060   REF  13  LAST 1032   15,2532  26 102 0  CM/GYMIC  ADS    CM/FLAGS      GYMDIFSW: C(A)=1, KNOW BIT IS 0
0061   REF 192  LAST 1030   15,2533  3 4714 1            CAF    ZERO
0062   REF   2  LAST  108   15,2534  55'711 C            TS     JETAG
0063   REF   2  LAST  108   15,2535  55'706 C            TS     OLDELP
0064   REF   2  LAST  108   15,2536  55'707 1            TS     OLDELG
0065   REF   2  LAST  108   15,2537  55'710 1            TS     OLDELR
0066   REF   4  LAST  837   15,2540  55'723 1            TS     GAMDCT        NO GYM DIF, PROB NO GAM DIF.
0067   REF   1              15,2541  0 2522 C            TC     DOBRATE1
```

P0068 COME HERE TO CORRECT FOR OVERFLOW IN ANGULAR CALCULATIONS

```
0069  REF 132  LAST 1029   15,2542  54 001 1  ANGOVCOR TS      L          THIS COSTS 2 MCT TO USE.
0070  REF 202  LAST 1030   15,2543  0 0002 0             TC      Q          NO OVFL
0071  REF 243  LAST 1032   15,2544  50 000 1             INDEX   A
0072  REF   2  LAST  839   15,2545  3 4673 1             CAF     LIMITS
0073  REF 133  LAST 1033   15,2546  26 001 1             ADS     L
0074  REF 203  LAST 1033   15,2547  0 0002 0             TC      Q

0075                        6000                         BLOCK   3

0076  REF   1                                            COUNT   03/DAPEN

0077                        6000     3 0007 0  FLUSHJET  CA      7          COME HERE TO TURN OFF ALL JETS.
0078                        6001     0 0006 1            EXTEND
0079  REF   1               6002     01 006 0            WRITE   ROLLJETS   ZERO CHANNEL 6
0080                        6003     0 0006 1            EXTEND
0081  REF   1               6004     01 005 0            WRITE   PYJETS     ZERO CHANNEL 5
0082  REF 204  LAST 1033    6005     0 0002 0            TC      Q

0083                      15,2550                        BANK    15

0084  REF   2 LAST 1031 TO 1033:     60     60*          COUNT   15/DAPEN
0085  REF   2  LAST 1031   15,2000                      SETLOC  ETRYCAP
0086                        15,2550                      BANK

0087                        15,2550  4 0000 0  RATEAVG   COM                SUBROUTINE TO ESTIMATE RATES IN PRESENCE
0088  REF   4  LAST 1032   15,2551  6 1720 0            AD      JETEM      OF CONSTANT ACCELERATION.
0096                        15,2552  0 0006 1            EXTEND
0097  REF   3  LAST  434   15,2553  7 4675 0            MP      HALF       DELV (EST) = DELV +(DELV-OLDELV)/2
0098  REF   5  LAST 1033   15,2554  6 1720 0            AD      JETEM
0099  REF 205  LAST 1033   15,2555  0 0002 0            TC      Q
```

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P0101 THESE ARE CALLED FOR THE VARIOUS INITIALIZATIONS NEEDED.

```
0102                        20,3550                 BANK   20
0103  REF   1               20,2000                 SETLOC DAPS1
0104                        20,3550                 BANK

0105  REF   1                                       COUNT  20/DAPEN

0106  REF  33  LAST 1032   E6,1661                  EBANK= AOG

0107  REF   3  LAST  838   20,3550  3 4752 C  CM/DAPON CA     EBAOG
0108  REF  40  LAST  838   20,3551  54 003 C          TS     EBANK

0109  REF  52  LAST  780   20,3552  0 5447 C          TC     DOWNFLAG    RESET DAPBIT1.  T5 RESTART IDENTIFIER.
01095 REF   2  LAST  687   20,3553   00132 1          ADRES  DAPBIT1     BIT 15  FLAG 6          CM FLAGS.
0110  REF  53  LAST 1034   20,3554  0 5447 C          TC     DOWNFLAG    RESET DAPBIT2
01105 REF   2  LAST  687   20,3555   00133 C          ADRES  DAPBIT2     BIT 14  FLAG 6
0111                        20,3556  0 0006 1         EXTEND
0112  REF   1               20,3557  3 3675 C         DCA    T5IDLER1    DISABLE RCS CALCULATION
0113  REF  22  LAST 1027   20,3560  53'313 C         DXCH   T5LOC
0114                        20,3561  0 0006 1         EXTEND
0115  REF   2  LAST 1034   20,3562  3 3675 C         DCA    T5IDLER1    DISABLE RCS JET CALLS
0116  REF   4  LAST  984   20,3563  53'311 1         DXCH   T6LOC

0117  REF   3  LAST 1032   20,3564  0 6000 1         TC     FLUSHJET    JETS DEPARTED  CM SM. ZERO JET BITS.

0118  REF   5  LAST  980   20,3565  4 7707 1         CS     13,14,15
0119  REF  71  LAST 1007   20,3566  7 1466 C         MASK   DAPDATR1    SET  CONFIG  BITS =0 FOR ENTRY
0120  REF  72  LAST 1034   20,3567  55'466 C         TS     DAPDATR1
0121                        20,3570  0 3574 1         TC     +4

0122  REF   7  LAST  901   20,3571  3 4731 C  NOTYET  CA     .5SEC
0123  REF 245  LAST  888   20,3572  0 4555 C         TC     BANKCALL
0124  REF  13  LAST  885   20,3573   01730 1         CADR   DELAYJOB    (DELAYJOB DOES INHINT)
0125  REF  29  LAST 1003   20,3574  3 4700 1  +4     CA     BIT11       GAMDIFSW = 94D  BIT11,  INITLY=0
0126  REF  14  LAST 1032   20,3575  7 0102 C         MASK   CM/FLAGS    IF ZERO, WAIT UNTIL CM/POSE UPDATE.
0127                        20,3576  0 0006 1         EXTEND
0128  REF   1               20,3577  1 3571 C         BZF    NOTYET

0129  REF 114  LAST 1032   20,3600  4 4712 C         CS     ONE         ACTIVATE CM/DAP
0130  REF  51  LAST 1029   20,3601  55'501 C         TS     RCSFLAGS    USE BIT3 TO INITIALIZE NEEDLER ON
A0131                                                                  NEXT PASS.
0132  REF   3  LAST  746   20,3602  55'727 C         TS     P63FLAG     SO WAKEP62 WILL NOT BE INITIATED UNTIL
A0133                                                                  HEADSUP IS SET IN P62.
A0134                                                        FLAG TO PREVENT MULTIPLE CALLS TO WAKEP62.

0135                        20,3603  3 0007 C         CA     7
0136  REF   3  LAST 1032   20,3604  55'711 C         TS     JETAG
01361 REF   3  LAST  172   20,3605  55'713 1         TS     PAXERR1     KEEP NEEDLES ZERO UNTIL DAP UPDATE
A01362                                                                 IN CASE CMDAPMOD IS NOT +1.
```

```
0137                          20,3606  0 0004 0        INHINT
0138                          20,3607  0 0006 1        EXTEND
0139  REF   4  LAST  838      20,3610  3 1666 0        DCA     ALFA/180      DO ATTITUDE HOLD UNTIL KEYBOARD
0140  REF   3  LAST  744      20,3611  53'604 0        DXCH    ALFACDM       ESTABLISHES HEADSUP.
0141  REF   5  LAST  838      20,3612  3 1664 1        CA      ROLL/180
0142  REF   2  LAST  109      20,3613  55'717 0        TS      ROLLHOLD      FOR ATTITUDE HOLD IN MODE +1.
0143                          20,3614  0 0006 1        EXTEND
0144  REF   4  LAST 1033      20,3615  7 4675 0        MP      HALF
0145  REF  12  LAST  824      20,3616  55'715 1        TS      ROLLC         NOT INTERESTED IN LO WORD.

0146  REF  15  LAST 1034      20,3617  4 0102 0        CS      CM/FLAGS
0147  REF  28  LAST  929      20,3620  7 4677 1        MASK    BIT12         CMDAPARM =93D BIT12  INITLY=0
0148  REF  16  LAST 1035      20,3621  26 102 0        ADS     CM/FLAGS      SET BIT TO 1.

0149  REF  16  LAST  774      20,3622  4 0076 1        CS      FLAGWRD2      SET  NODOFLAG  TO PREVENT FURTHER
0150  REF  73  LAST 1031      20,3623  7 4712 0        MASK    BIT1          V 37 ENTRIES.
0151  REF  17  LAST 1035      20,3624  26 076 1        ADS     FLAGWRD2

0152                          20,3625  0 0003 1        RELINT

0153  REF  5E  LAST  966      20,3626  0 4574 0        TC      POSTJUMP
0154  REF   1                 20,3627   54342 0        CADR    P62.1
```

```
P0155   INITIALIZE CM/CAP.  WAITLIST CALL FOR READGYMB.  SET SWITCH CM/DSTBY =1
R0156   SO READACCS WILL ENTER A WTLST CALL FOR  SETJTAG  .
R0157    CMDAPARM  = 0    , SO ONLY BODY RATE AND ATTITUDE CALCULATIONS ARE DONE.
R0158   SET AVEGEXIT TO CONTINUE AT CM/POSE
R0159

 0160   REF   4  LAST 1034   20,3630  3 4752 C  CM/DAPIC CA     EBADG
 0161   REF  41  LAST 1034   20,3631  54 003 C            TS     EBANK

 0162                        20,3632  0 0004 C            INHINT
 0163   REF  15  LAST  80C   20,3633  4 1205 C  CM/DAP2C CS     PIPTIME +1
A0164                                                           PRIO OF P62 L PRIO AVG,:PIPTM=PIPTM1
 0165   REF   6  LAST 1033   20,3634  55*720 1            TS     JETEM

 0166   REF   1              20,3635  3 4675 1            CA     POS1/2
 0167   REF   2  LAST 1036   20,3636  6 4675 1            AD     POS1/2
 0168   REF  14  LAST  721   20,3637  6 0025 0            AD     TIME1       OVFL GUARANTEED
 0169   REF   7  LAST 1036   20,3640  27*720 1            ADS    JETEM       C(A) = DELTA TIME SINCE PIPUP

 0170   REF  24  LAST  986   20,3641  4 4715 1            CS     FIVE
 0171   REF   8  LAST 1036   20,3642  6 1720 C            AD     JETEM
 0172   REF 244  LAST 1033   20,3643  10 000 0            CCS    A
 0173   REF   1              20,3644  6 3673 C            AD     -CDUT+1
 0174                        20,3645  1 3643 1            TCF    -2
 0175                        20,3646  13 647 C            NOOP
 0176   REF 115  LAST 1034   20,3647  6 4712 1            AD     ONE         SEND NO ZERO TO WTLST
 0177   REF   6  LAST 1031   20,3650  55*725 1            TS     CM/GYMDT    FOR RESTART
 0178   REF  46  LAST 1032   20,3651  0 5140 1            TC     WAITLIST
 0179   REF  34  LAST 1034   E6,1661                      EBANK= ADG
 0180   REF   3  LAST 1032   20,3652   02454 C           2CADR  READGYMB
 0180                        20,3653   32066 C

 0181   REF   1              20,3654  4 3672 C            CS     CM/SWIC1    GAMDIFSW, GYMDIFSW, CM/DSTBY
 0182   REF  17  LAST 1035   20,3655  7 0102 0            MASK   CM/FLAGS    DAPARM, .05GSW, LATSW, ENTRYDSP
 0183   REF   1              20,3656  6 4377 0            AD     CM/SWIC2    SET CM/DSTBY, LATSW
A01831                                                          DISABLE ENTRY DISPLAY, SINCE DES. GIMB.
A01832                                                          CALC. (P62.3) GOES TO ENDEXIT.
 0184   REF  18  LAST 1036   20,3657  54 102 C            TS     CM/FLAGS

 0185                        20,3660  3 0007 0            CA     7
 0186   REF   5  LAST  838   20,3661  55*666 1            TS     BETA/180    NECESSARY: NO OVFL CORRECTION
 0188   REF 116  LAST 1036   20,3662  3 4712 1            CA     ONE         INITIALIZE THE TM OF BODY RATES VIA
 0189   REF   1              20,3663  54 305 C            TS     SW/NDX        UPBUFF.

 0190   REF  29  LAST  826   20,3664  0 5261 1            TC     2PHSCHNG    DOES INHINT/RELINT
 0191                        20,3665   40116 C           OCT    40116       SAVE TBASE6
 0192                        20,3666   05024 1           OCT    05024
 0193                        20,3667   13000 C           OCT    13000

 0194   REF  59  LAST 1035   20,3670  0 4574 C            TC     POSTJUMP
```

```
0195   REF   1              20,3671   54326 1          CADR   P62.2

0196                        20,3672   16017 0  CM/SWIC1 OCT    16017
01961  REF   8  LAST 1032     4377            CM/SWIC2 =      TEN          00012 : CM/DSTBY, LATSW
0197                        20,3673   77766 0  -CDUT+1  OCT    77766
0198   REF  23  LAST 1034     1312                      EBANK= T5LOC
0199   REF   6  LAST  687   20,3674   03132 1  T5IDLER1 2CADR  T5IDLCC
0199                        20,3675   12062 0
```

```
R0200   THIS SECTION CALCULATES THE ANGULAR BODY RATES EACH .1 SEC.  THE ANGULAR RATES ARE THOSE ALONG THE BODY AXES
R0202   XB, YB, ZB, AND ARE NORMALLY DESIGNATED  P, Q, R.        REQUIREMENT:  TEMPORARY ERASE. JETEM, JETEM +1

R0204                SINCE RESTARTS ZERO THE JET OUTPUT CHANNELS, NO ATTEMPT IS MADE TO RESTART THE  ENTRY DAPS. THAT IS,
R0206   THE 0.1 SEC DAPS WILL MISS A CYCLE, AND WILL PICK UP AT THE NEXT 0.1 SEC UPDATE. MOST OF THE TIME THE 2 SEC
R0208   ROLL SYSTEM WILL MISS ONLY 0.1 SEC OF CONTROL. HOWEVER IF THE RESTART OCCURS AFTER THE  SECTION TIMETST HAS
R0210   STARTED, THEN THE ROLL SYSTEM WILL MISS ONE CYCLE.
R0211   THIS IS NECESSARY  UNDER THE GROUNDRULE THAT NO JET COMMANDS SHALL BE LESS THAN 14 MS.

 0213   REF  35  LAST 1036   E6,1661                        EBANK= AOG
 0214                        15,2556                        BANK   15
 0215   REF   3  LAST 1033   15,2000                        SETLOC ETRYDAP
 02151                       15,2556                        BANK

 0216   REF   3 LAST 1033 TO 1034:     6    66*            COUNT  15/DAPEN

 0218   REF   5  LAST 1031   15,2556  3 1663 C  BODYRATE CA      AMG          THESE ARE 2S COMPL NOS, BUT USE ANYWAY.
 0219   REF   3  LAST  967   15,2557  0 4767 C           TC      SPCOS
 0220   REF   2  LAST  109   15,2560  55'511 1           TS      COSM

 0221   REF  36  LAST 1038   15,2561  3 1661 1           CA      AOG          C(AOG) = AOG/180
 0222   REF   3  LAST  967   15,2562  0 4770 C           TC      SPSIN        SINO
 0223   REF   2  LAST  109   15,2563  55'512 1           TS      SINO         SINO = SIN(AOG)
 0224                        15,2564  0 0006 1           EXTEND
 0225   REF   3  LAST 1038   15,2565  7 1511 1           MP      COSM
 0226   REF   2  LAST  109   15,2566  55'514 1           TS      SINOCOSM     SO CM

 0227   REF  37  LAST 1038   15,2567  3 1661 1           CA      AOG
 0228   REF   4  LAST 1038   15,2570  0 4767 C           TC      SPCOS        COSO
 0229   REF   2  LAST  109   15,2571  55'513 C           TS      COSO

 0230                        15,2572  0 0006 1           EXTEND
 0231   REF   4  LAST 1038   15,2573  7 1511 1           MP      COSM
 0232   REF   1              15,2574  55'515 C           TS      COSOCOSM     CO CM

R0233   PITCHDOT:    Q TCDU/180 = IDOT TCDU/180 COSO COSM + MDOT TCDU/180 SINO

 0234   REF   3  LAST 1031   15,2575  4 1677 1           CS      -DELAMG
 0235                        15,2576  0 0006 1           EXTEND
 0236   REF   3  LAST 1038   15,2577  7 1512 1           MP      SINO
 0237   REF   9  LAST 1036   15,2600  53'721 C           DXCH    JETEM        2 LOCS _
 0238   REF   3  LAST 1031   15,2601  4 1676 C           CS      -DELAIG
 0239                        15,2602  0 0006 1           EXTEND
 0240   REF   2  LAST 1038   15,2603  7 1515 C           MP      COSOCOSM
 0241   REF  10  LAST 1038   15,2604  21'721 C           DAS     JETEM
 0242   REF  11  LAST 1038   15,2605  3 1720 C           CA      JETEM
 0243   REF   3  LAST 1032   15,2606  57'707 C           XCH     OLDELQ
 0244   REF   1              15,2607  0 2550 C           TC      RATEAVG
 0245   REF   2  LAST  108   15,2610  55'702 1           TS      QREL         PITCHDOT = Q TCDU/180
```

P0246 YAWDOT: R TCDU/180 = -IDOT TCDU/180 COSM SINO + MDOT TCDU/180 COSO

0247	REF	4	LAST 1038	15,2611	4 1677	1	CS	-DELAMG	
0248				15,2612	0 0006	1	EXTEND		
0249	REF	3	LAST 1038	15,2613	7 1513	C	MP	COSO	
0250	REF	12	LAST 1038	15,2614	53'721	C	DXCH	JETEM	
0251	REF	4	LAST 1038	15,2615	3 1676	1	CA	-DELAIG	
0252				15,2616	0 0006	1	EXTEND		
0253	REF	3	LAST 1038	15,2617	7 1514	1	MP	SINOCOSM	
0254	REF	13	LAST 1039	15,2620	21'721	C	DAS	JETEM	
0255	REF	14	LAST 1039	15,2621	3 1720	C	CA	JETEM	
0256	REF	3	LAST 1032	15,2622	57'710	C	XCH	OLDELP	
0257	REF	2	LAST 1038	15,2623	0 2550	C	TC	RATEAVG	
0258	REF	2	LAST 108	15,2624	55'703	C	TS	RREL	YAWDOT = R TCDU/180

R0259 ROLLDOT: P TCDU/180 = CDOT TCDU/180 + IDOT TCDU/180 SINM

0260	REF	6	LAST 1038	15,2625	3 1663	C	CA	AMG	
0261	REF	4	LAST 1038	15,2626	0 4770	C	TC	SPSIN	
0262	REF	2	LAST 109	15,2627	55'510	C	TS	SINM	
0263				15,2630	0 0006	1	EXTEND		
0264	REF	5	LAST 1039	15,2631	7 1676	C	MP	-DELAIG	
0265	REF	15	LAST 1039	15,2632	55'720	1	TS	JETEM	
0266	REF	193	LAST 1032	15,2633	3 4714	1	CA	ZERO	
0267				15,2634	20 001	1	DDOUBL		ROUND L INTO A
0268	REF	3	LAST 1031	15,2635	6 1675	1	AD	-DELADG	
0269	REF	16	LAST 1039	15,2636	6 1720	C	AD	JETEM	
0270	REF	245	LAST 1036	15,2637	4 0000	C	CS	A	
0271	REF	17	LAST 1039	15,2640	55'720	1	TS	JETEM	
0272	REF	3	LAST 1032	15,2641	57'706	1	XCH	OLDELP	
0273	REF	3	LAST 1039	15,2642	0 2550	C	TC	RATEAVG	
0274	REF	2	LAST 108	15,2643	55'701	1	TS	PREL	ROLLDOT = P TCDU/180

A0275 IF GAMDOT < 0.5 DEG/SEC, THEN GAMDOT =0

0276	REF	5	LAST 1032	15,2644	11'723	1	CCS	GAMDOT	
0277				15,2645	0 2647	C	TC	+2	
0278	REF	1		15,2646	0 2671	C	TC	NOGAMDOT	
0279	REF	6	LAST 1035	15,2647	4 1664	C	CS	ROLL/180	
0280	REF	5	LAST 1039	15,2650	0 4770	C	TC	SPSIN	
0281				15,2651	0 0006	1	EXTEND		
0282	REF	6	LAST 1039	15,2652	7 1723	1	MP	GAMDOT	
0283	REF	18	LAST 1039	15,2653	55'721	C	TS	JETEM +1	-SR GAMDOT
0284				15,2654	0 0006	1	EXTEND		
0285	REF	2	LAST 109	15,2655	7 1507	C	MP	SALFA	SIN(ALFA)
0287	REF	3	LAST 1039	15,2656	27'701	1	ADS	PREL	PREL TCDU/180=(P-SALF SR GAMDOT)TCDU/180
0288	REF	7	LAST 1039	15,2657	3 1664	1	CA	ROLL/180	
0289	REF	5	LAST 1036	15,2660	0 4767	C	TC	SPCOS	

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0290                          15,2661  4 0000 C          COM
0291                          15,2662  0 0006 1          EXTEND
0292  REF   7  LAST 1039     15,2663  7 1723 1          MP      GAMDOT
0293  REF   3  LAST 1038     15,2664  27'702 1          ADS     QREL          QREL TCDU/180=(C-CR GAMDOT) TCDU/180

0294  REF  19  LAST 1039     15,2665  4 1721 C          CS      JETEN +1      B( ) = -SR GAMDOT
0295                          15,2666  0 0006 1          EXTEND
0296  REF   2  LAST  109     15,2667  7 1506 1          MP      CALFA         COS(ALFA)
0297  REF   3  LAST 1039     15,2670  27'703 C          ADS     RREL          RREL TCDU/180=(R+CALF SR GAMDOT)TCDU/180

0298  REF  29  LAST 1035     15,2671  3 4677 C  NOGAMCUT CA      BIT12         CMDAPARM = 93D  BIT 12
0299  REF  19  LAST 1036     15,2672  7 0102 C          MASK    CM/FLAGS
0300                          15,2673  0 0006 1          EXTEND
0301  REF  52  LAST 1032     15,2674  1 5213 C  STBYDUMP BZF     TASKOVER      DAP NOT ARMED.

0302  REF  27  LAST 1003     15,2675  3 4672 C          CA      POSMAX        PICK UP AT ATTRATES IN 10 MS OR SO.
0303  REF  25  LAST 1007     15,2676  54 030 C          TS      TIME5

0304                          15,2677  0 0006 1          EXTEND
0305  REF   1                15,2700  3 2704 C          DCA     ATDOTCAD
0306  REF  24  LAST 1037     15,2701  53'313 C          DXCH    T5LOC
A0307                                                   DOES NOT PROTECT TEMK, SQ IN SPSIN/COS

0308  REF  53  LAST 1040     15,2702  0 5213 1          TC      TASKOVER

0309  REF  38  LAST 1038     E6,1661                           EBANK= AOG
0310  REF   1                15,2703  02705 1  ATDOTCAD 2CADR  ATTRATES
0310  REF   1                15,2704  32066 C
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P0311 CALCULATE BODY ATTITUDE RATES AND INTEGRATE TO OBTAIN ATTITUDE ANGLES.

R0312 CB PHIDOT TCDU/180 = (CA PREL + SA RREL) TCDU/180
R0313 BETADOT TCDU/180 = (-SA PREL + CA RREL) TCDU/180
R0314 ALFADOT TCDU = (QREL + SB PHIDOT) TCDU/180

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0315  REF  20  LAST 1029   15,2705  22 016 C  ATTRATES LXCH   BANKRUPT        CONTINUE HERE VIA T5
0316                       15,2706  0 0006 1            EXTEND                TASK MAY BE SKIPPED AT RESTART.
0317  REF  16  LAST 1029   15,2707  22 012 1            QXCH   QRUPT
0318  REF  11  LAST  354   15,2710  3 0021 1            CA     SR
0319                       15,2711  6 0000 1            DOUBLE
0320  REF   2  LAST  110   15,2712  55'623 0            TS     CM/SAVE
A0321                                                        DOES NOT PROTECT TEMK, SC IN SPSIN/COS

0322  REF   4  LAST 1040   15,2713  3 1702 C            CA     QREL
0323  REF   5  LAST 1035   15,2714  6 1665 C            AD     ALFA/180
0324  REF   1              15,2715  0 2542 C            TC     ANGOVCOR
0325  REF   6  LAST 1041   15,2716  55'665 1            TS     ALFA/180
0326  REF   6  LAST 1039   15,2717  0 4767 C            TC     SPCOS
0327  REF   3  LAST 1040   15,2720  55'506 1            TS     CALFA          CALFA
0328  REF   2  LAST  108   15,2721  55'705 C            TS     PHIDOT

0329                       15,2722  0 0006 1            EXTEND
0330  REF   4  LAST 1039   15,2723  7 1701 1            MP     PREL
0331  REF   3  LAST 1041   15,2724  57'705 1            XCH    PHIDOT         CA PREL
0332                       15,2725  0 0006 1            EXTEND
0333  REF   4  LAST 1040   15,2726  7 1703 C            MP     RREL           CA RREL
0334  REF   2  LAST  108   15,2727  55'704 1            TS     BETADOT

0335  REF   7  LAST 1041   15,2730  3 1665 C            CA     ALFA/180
0336  REF   6  LAST 1039   15,2731  0 4770 C            TC     SPSIN
0337  REF   3  LAST 1039   15,2732  55'507 C            TS     SALFA          SIN(ALFA)

0338                       15,2733  0 0006 1            EXTEND
0339  REF   5  LAST 1041   15,2734  7 1703 C            MP     RREL           SA RREL
0340  REF   4  LAST 1041   15,2735  27'705 C            ADS    PHIDOT         CB PHIDOT, SAVED.

0341  REF   4  LAST 1041   15,2736  4 1507 C            CS     SALFA
0342                       15,2737  0 0006 1            EXTEND
0343  REF   5  LAST 1041   15,2740  7 1701 1            MP     PREL
0344  REF   3  LAST 1041   15,2741  27'704 1            ADS    BETADOT        SAVE BETADOT TCDU/180
0345  REF   6  LAST 1036   15,2742  27'666 1            ADS    BETA/180       BETA DONE.

0346  REF   7  LAST 1041   15,2743  0 4770 0            TC     SPSIN
0347                       15,2744  0 0006 1            EXTEND
0348  REF   5  LAST 1041   15,2745  7 1705 0            MP     PHIDOT         NEGLECT CB IN  CB PHIDOT
0349  REF   8  LAST 1041   15,2746  6 1665 C            AD     ALFA/180
0350  REF   2  LAST 1041   15,2747  0 2542 C            TC     ANGOVCOR
0351  REF   9  LAST 1041   15,2750  55'665 1            TS     ALFA/180       ALFA DONE.
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0352                          15,2751  4 0000 C        COM
0353  REF   4  LAST 1035     15,2752  6 1603 0        AD      ALFACCM
0354  REF   3  LAST 1041     15,2753  0 2542 C        TC      ANGOVCOR       JUST IN CASE ...
0355  REF   7  LAST  991     15,2754  55'477 C        TS      AK1
0356  REF   2  LAST  110     15,2755  55'572 1        TS      QAXERR         FOR PITCH FDAI   AND EDIT.

0357  REF   6  LAST 1041     15,2756  3 1705 1        CA      PHIDOT         PHIDOT TCDU/180, NEGLECTING CB
0358  REF   8  LAST 1039     15,2757  6 1664 1        AD      ROLL/180
0359  REF   4  LAST 1042     15,2760  0 2542 C        TC      ANGOVCOR
0360  REF   3  LAST  172     15,2761  55'714 C        TS      ROLLTM         ROLL/180 FOR TM.
0361  REF   9  LAST 1042     15,2762  55'664 0        TS      ROLL/180       ROLL DONE.

R0362       START YAW AUTOPILOT HERE .  RATE DAMPING WITH ENFORCED COORDINATED ROLL MANEUVER.

0364  REF  31  LAST  979     15,2763  3 4710 0        CA      BIT3           .05GSW =1020 BIT3        SW=0, LESS .05G
0365  REF  20  LAST 1040     15,2764  7 0102 0        MASK    CM/FLAGS       SWITCH =1, GREATER THAN .05 G
0366                          15,2765  0 0006 1        EXTEND
0367  REF   1                 15,2766  1 3053 0        BZF     EXDAP          IF G LESS THAN .05
0368  REF 117  LAST 1036      15,2767  4 4712 C        CS      ONE            IF G GEQ  THAN .05
0369  REF   5  LAST  745      15,2770  55'700 C        TS      CMDAPMOD       SAVE -1 FOR USE IN CM/RCS

0370  REF   8  LAST 1042     15,2771  55'477 C        TS      AK1            TO ZERO PITCH AND YAW FDAI NEEDLES
0371  REF   8  LAST  991     15,2772  55'500 1        TS      AK2            IN ATM.  (MODE =-1)

0372  REF   4  LAST 1041     15,2773  3 1704 C        CA      BETADOT
0373                          15,2774  0 0006 1        EXTEND
0374  REF   4  LAST 1041     15,2775  11'506 1        DV      CALFA
0375  REF   1                 15,2776  0 3043 0        TC      2D/SDZ         GO TEST DZ. GET TAG: +0 IF IN DZ
0376  REF 246  LAST 1039      15,2777  50 000 1        INDEX   A              +/- 1 IF NOT
0377  REF   1                 15,3000  3 3215 1        CAF     YJETCODE

0378  REF  20  LAST 1040     15,3001  55'720 1        TS      JETEM

R0379       START PITCH AUTOPILOT HERE.  RATE DAMPING ONLY.

0380  REF   5  LAST 1041     15,3002  3 1702 C        CA      QREL
0381  REF   2  LAST 1042     15,3003  0 3043 0        TC      2D/SDZ
0382  REF 247  LAST 1042     15,3004  50 000 1  EXDAPIN INDEX  A              COME HERE FROM EX ATM DAP
0383  REF   1                 15,3005  3 3220 1        CAF     P/RJCODE
0384  REF  21  LAST 1042     15,3006  27'720 1        ADS     JETEM          COMBINE ALL NEW BITS.

0385                          15,3007  0 0006 1        EXTEND                 DOES NOT REQUIRE SAVING OLD CODES.
0386  REF   2  LAST 1033     15,3010  01 005 C        WRITE   PYJETS         SET PYCHAN TO DESIRED BIT CONFIG.

0387  REF   4  LAST 1034     15,3011  11'711 0        CCS     JETAG
0388  REF   1                 15,3012  0 3231 1        TC      CM/RCS
0389  REF   1                 15,3013  0 3677 1        TC      CM/FDAI
0390  REF   2  LAST 1042     15,3014  0 3677 1        TC      CM/FDAI
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P0391 DEAD ZONE LOGIC USED BY ENTRY DIGITAL AUTOPILOTS.

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 0392   REF 248  LAST 1042   15,3015  10 000 C  3DDZ     CCS   A          YAWLIM=1.0-3/180=16384-273=16111
 0393   REF   1              15,3016  6 3212 C           AD    YAWLIM
 0394   REF   1              15,3017  1 3047 C           TCF   DZCOM
 0395   REF   2  LAST 1043   15,3020  6 3212 C           AD    YAWLIM
 0396   REF   1              15,3021  1 3050 C           TCF   DZNOCOM

A0397                                                          BIASED DZ FOR EXT ATM CAP.
 0398   REF   1              15,3022  55'624 1  BIASEDZ   TS    JETEM2     SAVE RATE/180. ERROR/180 IS IN L.
 0399   REF 249  LAST 1043   15,3023  10 000 C           CCS   A          START ERROR DZ.
 0400   REF   1              15,3024  4 3211 1           CS    CM/BIAS    = .6/180
 0401                        15,3025  1 3027 C           TCF   +2
 0402   REF   2  LAST 1043   15,3026  3 3211 C           CA    CM/BIAS
 0403   REF 134  LAST 1033   15,3027  6 0001 C           AD    L          BIAS THE ERROR.
 0404   REF 206  LAST 1033   15,3030  22 002 C           LXCH  Q          SAVE CALLERS RETURN ADDRESS.
 0405   REF   1              15,3031  0 3015 C           TC    3DDZ       GO GENERATE THE ERROR BIT.
 0406   REF 135  LAST 1043   15,3032  52 002 1           DXCH  L          BIT TO L, RESTORE CALLERS Q.
 0407   REF   2  LAST 1043   15,3033  11'624 1  4D/SDZ    CCS   JETEM2     CAME HERE IN EXT ATM. C(L) = ERROR BIT
 0408   REF   1              15,3034  6 3207 1           AD    4D/SLIM    IF RATE GEQ 4D/S, SET L=0 AND TAKE
 0409                        15,3035  1 3037 1           TCF   +2         JET BITS ACCORDING TO SGN OF RATE.
 0410   REF   2  LAST 1043   15,3036  6 3207 1           AD    4D/SLIM
 0411   REF 250  LAST 1043   15,3037  54 000 C           TS    A
 0412                        15,3040  1 3042 C           TCF   +2         RATE OK. CONTINUE
 0413                        15,3041  22 007 C           ZL               RATE GEQ 4 D/S. OVER RIDE ERROR BIT
 0414   REF   3  LAST 1043   15,3042  57'624 C           XCH   JETEM2     AND CONTINUE TO GET SIGN.

 0415   REF 251  LAST 1043   15,3043  10 000 C  2D/SDZ    CCS   A          COME HERE TO TEST IF A WITHIN 2DEG/S DZ
 0416   REF   1              15,3044  6 3210 1           AD    YDOTLIM    1.0 - YDOT DZ          ( OR PDOT)
 0417                        15,3045  1 3050 C           TCF   +3
 0418   REF   2  LAST 1043   15,3046  6 3210 1           AD    YDOTLIM    YDOT DZ = 2 DEG/SEC
 0419                        15,3047  4 0000 C  DZCOM     COM
 0420   REF  22  LAST 1042   15,3050  55'721 C  DZNOCOM   TS    JETEM +1   GENERATE TAG, SET C(A)= -+1 OUTSIDE DZ
 0421   REF 194  LAST 1039   15,3051  3 4714 1           CA    ZERO       SET C(A) = +0 INSIDE
 0422   REF 207  LAST 1043   15,3052  0 0002 C           TC    Q
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P0423           EXTRA ATMOSPHERIC DIGITAL AUTOPILOT

R0424           1.   IF ABS(CALF) -C(45) POS, USE                  IF CALFA POS, CMDAPMOD= +0
R0426            BETA:   YAW ERROR = SGN(CALF) (BETACOM -BETA)     IF CALFA NEG, CMDAPMOD =-0
R0428                      RATE = BETADOT                          IF CMDAPMOD =-0, RATE =  RREL
R0430                   R-AXIS = CONTROL

R0431            ROLL:   ROLL ERROR = SGN(CALF) (ROLLC - ROLL)     IF CMDAPMOD = -0, RATE DAMP ONLY.
R0433                      RATE = PREL
R0434                   P-AXIS = CONTROL

R0435           2.   IF C(45) GEQ CALFA GEQ -C(45), USE            CMDAPMOD = +1
R0437            BETA:   ROLL ERROR = SGN(-SALF) (BETACOM -BETA)
R0438                      RATE = BETADOT
R0439                   P-AXIS = CONTROL

R0440            ROLL:   YAW ERROR = SGN(SALF) (ROLLC -ROLL)       RATE DAMP ONLY.
R0442                      RATE = RREL
R0443                   R-AXIS = CONTROL

R0444           3.   FOR ALL CASES , USE
R0445            ALFA:   PITCH ERROR = (ALFACOM - ALFA)
R0446                      RATE = QREL
R0447                   Q-AXIS = CONTROL
R0448

0449   REF   6  LAST 1042   15,3053  55'700 C  EXDAP   TS     CMDAPMOD        +0 FOR NOW
0450   REF   7  LAST 1041   15,3054  4 1666 1          CS     BETA/180
0451   REF   2  LAST  109   15,3055  6 1604 1          AD     BETACOM
0452   REF  23  LAST 1043   15,3056  55'721 C          TS     JETEM +1        PRESERVE THIS FOR A WHILE.

0453   REF   5  LAST 1042   15,3057  11'506 1          CCS    CALFA
0454   REF   1              15,3060  6 3213 1          AD     C45LIM          =1.0-COS(45)
0455                        15,3061  1 3063 C          TCF    +2
0456   REF   2  LAST 1044   15,3062  6 3213 1          AD     C45LIM
0457   REF 252  LAST 1043   15,3063  54 000 C          TS     A
0458   REF   1              15,3064  1 3143 0          TCF    EXDAP2          HERE IF ABS(CALFA)  L  COS(45)

0459   REF   4  LAST 1034   15,3065  11'727 C          CCS    P63FLAG
0460   REF   1              15,3066  0 3101 1          TC     EXDAP4
0461                        15,3067  0 3071 1          TC     +2
0462   REF   2  LAST 1044   15,3070  0 3101 1          TC     EXDAP4
0463   REF  90  LAST 1032   15,3071  0 5301 C          TC     PHASCHNG        SINGLE PASS THRCUGH HERE.
0464                        15,3072   40334 1          OCT    40334
0465   REF 118  LAST 1042   15,3073  4 4712 C          CS     ONE
0466   REF   5  LAST 1044   15,3074  55'727 C          TS     P63FLAG         SET FLAG TO ASSURE SINGLE PASS.
0467   REF   1              15,3075  3 3206 C          CA     NSEC
0468   REF  47  LAST 1036   15,3076  0 5140 1          TC     WAITLIST
0469   REF  39  LAST 1040   E6,1661                     EBANK= AOG
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0470   REF   2  LAST  208   15,3077   02374 C          2CADR  WAKEP62     CALL TO TERMINATE P62 IN N SEC.
0470                       15,3100   54066 C
A0471                                                                    65 DEG/ 3DEG/SEC = 21 SEC NOMINAL
A0472                                                                    TRANSIT TIME FROM ALFA=45 TO ALFA TRIM.

0473   REF   5  LAST 1042   15,3101   11'711 C  EXDAP4   CCS    JETAG       ROLLJET INTERFACE TEST BETWEEN .1 SEC
0474   REF   1              15,3102   1 3110 C          TCF    EXDAP3      DAP AND THE 2 SEC CM/RCS DAP
0475   REF   2  LAST 1045   15,3103   1 3110 C          TCF    EXDAP3
0476   REF 155  LAST 1043   15,3104   3 4714 1          CA     ZERO
0477                       15,3105   0 0006 1          EXTEND                 TURN OFF ROLL JETS IF ON AND WAIT
0478   REF   2  LAST 1033   15,3106   01 006 C          WRITE  ROLLJETS       UNTIL START OF 2 SEC CM/RCS CYCLE
0479   REF   6  LAST 1045   15,3107   55'711 C          TS     JETAG       RESTORE PROPER VALUE +0

A0480                                                                   ROLL FDAI WILL BE IN ERROR UNTIL NEXT CM/RCS CALL.
0481   REF   6  LAST 1044   15,3110   11'506 1  EXDAP3   CCS    CALFA       HERE IF ABS(CALFA) GEQ COS(45)
0482   REF  24  LAST 1044   15,3111   3 1721 1          CA     JETEM +1
0483   REF   1              15,3112   1 3116 C          TCF    EXDAP1
0484   REF 156  LAST 1045   15,3113   4 4714 C          CS     ZERO
0485   REF   7  LAST 1044   15,3114   55'700 C          TS     CMDAPMOD    FOR CM/RCS
0486   REF  25  LAST 1045   15,3115   4 1721 C          CS     JETEM +1
0487   REF   1              15,3116   55'573 C  EXDAP1   TS     RAXERR      FOR YAW FDAI
0488   REF   9  LAST 1042   15,3117   55'500 1          TS     AK2         WANT RAXERR FOR TM.
0489   REF 136  LAST 1043   15,3120   54 001 1          TS     L
0490   REF   8  LAST 1045   15,3121   11'700 C          CCS    CMDAPMOD    COORDINATE BETA CONTROL.
0491                       15,3122   0 3125 1          TC     +3          C(CMDAPMOD) CAN BE +1, +0, OR -0.
0492   REF 119  LAST 1044   15,3123   3 4712 1          CA     ONE         USE BETADOT TO COORD IN MODE +0
0493   REF 253  LAST 1044   15,3124   50 000 1          INDEX  A           OTHERWISE USE RREL.
0494   REF   6  LAST 1041   15,3125   3 1703 1          CA     RREL
0495   REF   1              15,3126   0 3022 1          TC     BIASEDZ     GO TEST DZ. +0 IF IN DZ, +-1 OTHERWISE
A0496                                                                   IF GEQ 4D/S, SET ERROR BIT IN L =0)
0497                       15,3127   0 0006 1          EXTEND
0498   REF  12  LAST  985   15,3130   04 001 1          ROR    LCHAN       L HAS BETA BIT
0499   REF 254  LAST 1045   15,3131   50 000 1          INDEX  A
0500   REF   2  LAST 1042   15,3132   3 3215 1          CAF    YJETCODE
0501   REF  26  LAST 1045   15,3133   55'720 1          TS     JETEM

0502   REF   3  LAST 1042   15,3134   3 1572 0          CA     QAXERR      ALFA ERROR.
0503   REF 137  LAST 1045   15,3135   54 001 1          TS     L
0504   REF   6  LAST 1042   15,3136   3 1702 0          CA     QREL        FOR ALFADOT USE QREL
0505   REF   2  LAST 1045   15,3137   0 3022 1          TC     BIASEDZ
0506                       15,3140   0 0006 1          EXTEND
0507   REF  13  LAST 1045   15,3141   04 001 1          ROR    LCHAN
0508   REF   1              15,3142   1 3004 1          TCF    EXDAPIN     CONTINUE ON IN DAP

0509   REF   9  LAST 1045   15,3143   25'700 1  EXDAP2   INCR   CMDAPMOD    SET CMDAPMOD TO +1

0510   REF 120  LAST 1045   15,3144   4 4712 C          CS     ONE         INDICATE CHANGE FROM .1 SEC UPDATE TO
0511   REF   7  LAST 1045   15,3145   55'711 C          TS     JETAG       TO 2 SEC FOR ROLL JETS.( IF CMDAPMOD
A0512                                                                   =0 AND JETAG =-1, QUENCHES JETS IF ON)
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0513   REF   6  LAST 1044   15,3146  11'727 C        CCS     P63FLAG         IF FLAG WAS +1, SET =0.
0514   REF   7  LAST 1046   15,3147  55'727 C        TS      P63FLAG
0515                        15,3150  13 151 C        NOOP

0516   REF   5  LAST 1041   15,3151  11'507 C        CCS     SALFA           BETA CONTROL WITH P JETS
0517   REF  27  LAST 1045   15,3152  4 1721 C        CS      JETEM +1
0518                        15,3153  1 3155 1        TCF     +2
0519   REF  28  LAST 1046   15,3154  3 1721 1        CA      JETEM +1
0520   REF   4  LAST 1034   15,3155  55'713 1        TS      PAXERR1         TEMP SAVE.  ERROR/180
0521                        15,3156  0 0006 1        EXTEND
0522   REF   5  LAST 1035   15,3157  7 4675 0        MP      HALF            CM/FDAI EXPECTS ERROR/360.
0523   REF   5  LAST 1046   15,3160  57'713 C        XCH     PAXERR1         ERROR/360 FOR FDAI, GET ERROR/180.
0524   REF 138  LAST 1045   15,3161  54 001 1        TS      L
0525   REF   6  LAST 1046   15,3162  11'507 C        CCS     SALFA
0526   REF   5  LAST 1042   15,3163  4 1704 1        CS      BETADOT         USE BETADOT TO COORD IN MODE +1
0527                        15,3164  0 3166 C        TC      +2
0528   REF   6  LAST 1046   15,3165  3 1704 C        CA      BETADOT
0529   REF   3  LAST 1045   15,3166  0 3022 1        TC      BIASEDZ
0530                        15,3167  0 0006 1        EXTEND
0531   REF  14  LAST 1045   15,3170  04 001 1        ROR     LCHAN
0532   REF 255  LAST 1045   15,3171  50 000 1        INDEX   A
0533   REF   2  LAST 1042   15,3172  3 3220 1        CAF     P/RJCODE        GET ROLL CODE
0534                        15,3173  0 0006 1        EXTEND                  ROLL CONTROL WITH YAW JETS.
0535   REF   3  LAST 1045   15,3174  01 006 C        WRITE   ROLLJETS        WE,LL SKIP REGULAR ROLL SYST

0536   REF   3  LAST 1035   15,3175  3 1717 1        CA      ROLLHOLD        ROLL/180 AT CM/DAPON TIME.
0537                        15,3176  0 0006 1        EXTEND
0538   REF  10  LAST 1042   15,3177  21'664 C        MSU     ROLL/180        1,S COMPL, BUT SO WHATS A BIT.?
0539   REF 139  LAST 1046   15,3200  54 001 1        TS      L               FORCE A LIMIT CYCLE IN YAW RATE.
0540   REF   7  LAST 1046   15,3201  11'507 C        CCS     SALFA
0541   REF 140  LAST 1046   15,3202  3 0001 0        CA      L               TO REMOVE ITS BIASING EFFECT ON M DOT.
0542   REF   2  LAST 1045   15,3203  0 3116 1        TC      EXDAP1
0543   REF 141  LAST 1046   15,3204  4 0001 1        CS      L
0544   REF   3  LAST 1046   15,3205  0 3116 1        TC      EXDAP1

0545                        15,3206   C4064 1  NSEC     DEC     2100            65 DEC/ 3 DEG/SEC
A0546                                                                IF NSEC IS CHANGED, REMEMBER TO CHANGE 4.335POT.
0547                        15,3207   37734 C  4D/SLIM  DEC     16348           1.0 -4/180 D/S = 4/1800 EXP 14
0548                        15,3210   37756 1  YDOTLIM  DEC     16366           =1.0 - YDOT D2= 16384 -18
A0549                                                                        YDOT D2 = YDOT TCDU/180 = 2/1800 EXP 14

0550                        15,3211   00067 C  CM/BIAS  DEC     55              =.6/180 B14  = 55
0551                        15,3212   37267 C  YAWLIM   DEC     16055           YAWLIM=1.0-3.6/180=16384-329=16055
0552                        15,3213   11277 C  C45LIM   DEC     .29289          =1.0-COS(45)
R0553
A0554                                        JET CODE TABLES FOLLOW _

0555                        15,3214   00120 1          OCTAL   00120           POS Y
0556                        15,3215   00000 1  YJETCODE OCTAL   00000           RCS JET BITS
0557                        15,3216   00240 1          OCTAL   00240           NEG Y
```

0558	15,3217	00005 1		OCTAL	00005	POS R JET BITS	ALSO POS P JET BITS
0559	15,3220	00000 1	P/RJCODE	OCTAL	00000		
0560	15,3221	00012 1		OCTAL	00012	NEG R	ALSO NEG P

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R0561   RCS         THIS SECTION IS ENTERED EACH 2 SEC BY WAITLIST CALL FOLLOWING A DELAY OF 1.2 SEC AFTER PIPUP.
R0563   THE TASK SETJTAG  SETS A FLAG IN  JETAG  TO SIGNIFY THAT ROLL UPDATE IS DUE.  IN ROUGHLY 5 CS  BPDYRATE WILL BE
R0565   EXECUTED AND JETAG WILL CAUSE  CM/RCS  TO ACT ON ROLLC IMMEDIATELY THEREAFTER.   THE
R0567   TASK SAVES THE CALL TIME SO THAT CM/RCS CAN DETERMINE HOW MUCH OF THE 2 SEC INTERVAL REMAINS BEFORE THE
R0569   NEXT UPDATE.

 0570   REF  15  LAST 1036   15,3222  4 0025 1  SETJTAG  CS      TIME1          SAVE NOMINAL UPDATE TIME FOR SYNCH
 0571   REF   2  LAST  108   15,3223  55'712 0            TS      TUSED
A0572                                                                          THE 5 CS APPEARS IN TIMETST.
 0573   REF 121  LAST 1045   15,3224  3 4712 1            CA      ONE            RATHER THAN INCR, FOR SAFETY
 0574   REF   8  LAST 1045   15,3225  55'711 0            TS      JETAG          SET JETAG=1 TO CAUSE CM/RCS TO BE
 0575   REF  51  LAST 1044   15,3226  0 5301 0            TC      PHASCHNG
 0576                        15,3227   00001 0            OCT     00001

 0577   REF  54  LAST 1040   15,3230  0 5213 1            TC      TASKOVER       EXECUTED AFTER NEXT BODYRATE UPDATE

R0578   PREDICTIVE ROLL SYSTEM    ENTRY STEERING PROVIDES ROLL COMMAND IN LOC ROLLC. THE FOLLOWING CALCULATES THE
R0580   TRAJECTORY TO THE ORIGIN IN PHASE PLANE (X,V). PROGRAM ENTERS JET ON AND OFF CALLS INTO WTLST TO PRODUCE
R0582   THE DESIRED TRAJECTORY. ONLY THOSE CALLS WHICH CAN BE EXECUTED WITHIN THE INTERVAL T  (2 SEC) ARE ENTERED IN
R0584   WTLST, THE REMAINDER ARE RECONSIDERED AT NEXT UPDATE.

 0585   REF   4  LAST  185        4674             HALFPR  EQUALS NEG1/2 +1

A0586                                                                          CLEAR JETAG BEFORE TIMETST.  SET TO +0 TO SHOW
A0587                                                                          ROLL DAP CALLED. IN EVENT OF RESTART, BODYRATE
A0588                                                                          MAY MISS A CYCLE. CM/RCS WILL MISS A CYCLE ONLY
A0589                                                                          IF A RESTART OCCURS AFTER TIMETST COMMENCES.

 0590   REF 122  LAST 1048   15,3231  4 4712 0  CM/RCS  CS      ONE
 0591   REF   2  LAST  109   15,3232  55'617 1            TS      JNDX           SET NDX FOR PCS ROLL, AND CHANGE LATER

 0592   REF   1              15,3233  4 4726 1            CS      2T/TCDU        ROLLDOT = DELAOG + DELAIG SINM =DELR
 0593                        15,3234  0 0006 1            EXTEND
 0594   REF   6  LAST 1041   15,3235  7 1701 1            MP      PREL           DELR/180 = RDOT TCDU/180 = RDOT/1800
 0595   REF 142  LAST 1046   15,3236  6 0001 0            AD      L              -2 RDOT T/180 IN L
 0596   REF   2  LAST  109   15,3237  55'613 0            TS      -VT/180        SAVE -2VT/180 HERE

 0597   REF  11  LAST 1046   15,3240  4 1664 0            CS      ROLL/180
 0598   REF  12  LAST 1041   15,3241  54 021 0            TS      SR             SAVE (-R/180) /2

 0599   REF  21  LAST 1042   15,3242  4 0102 0            CS      CM/FLAGS
 0600   REF  38  LAST 1024   15,3243  7 4707 1            MASK    BIT4           LATSW = 1010 BIT4
 0601                        15,3244  0 0006 1            EXTEND                 ROLL OVER TOP $
 0602   REF   1              15,3245  1 3253 1            BZF     GETLCX         NO, TAKE SHORTEST PATH
 0603   REF  22  LAST 1048   15,3246  26 102 0            ADS     CM/FLAGS       YES, ENFORCE ROLL OVER TOP.. (BIT =0)
 0604   REF  13  LAST 1035   15,3247  3 1715 0            CA      ROLLC          (ROLLC/180) /2
 0605   REF  13  LAST 1048   15,3250  6 0021 1            AD      SR             -(R/180) /2
 0606   REF   2  LAST  109   15,3251  57'614 0            XCH     LCX/360        DIFFERENT X REQD HERE. DISCONT AT 180.
 0607   REF   1              15,3252  1 3313 1            TCF     COMPAT         POSSIBLE OVFL ABOVE.
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0608   REF   3  LAST 1036   15,3253  3 4675 1  GETLCX  CA      POS1/2          FORM RCOM/360
0609                        15,3254  6 0000 1          DOUBLE
0610   REF  14  LAST 1048   15,3255  6 1715 C          AD      ROLLC
0611   REF   3  LAST 1048   15,3256  57'614 0          XCH     LCX/360         IGNORE POSSIBLE OVFL.

0612   REF  14  LAST 1048   15,3257  3 0021 1          CA      SR              FORM -R/360
0613   REF   5  LAST 1048   15,3260  6 4673 1          AD      NEG1/2
0614   REF   6  LAST 1049   15,3261  6 4673 1          AD      NEG1/2          IGNORE OVFL
0615   REF   4  LAST 1049   15,3262  57'614 C          XCH     LCX/360         -R/360
0616   REF   5  LAST 1049   15,3263  27'614 1          ADS     LCX/360         LCX/360 = RCOM/360 -R/360  RANGE (-1,1)

R0617  DOES SGN(-VT) (VT/180) (VT/180) (180/(4 A1 TT COSALFA)) + X/360 + SGN(X) / 2          OVFL   ?

0619   REF   3  LAST 1048   15,3264  11'613 C          CCS     -VT/180         TAKE SHORTEST ANGULAR PATH
0620   REF 123  LAST 1048   15,3265  6 4712 1          AD      ONE             (BASED ON SINGLE JET ACCELERATION)
0621                        15,3266  1 3270 C          TCF     +2
0622   REF 124  LAST 1049   15,3267  6 4712 1          AD      ONE
0623                        15,3270  0 0006 1          EXTEND
0624   REF   4  LAST 1049   15,3271  7 1613 C          MP      -VT/180         C(-VT/180) = -2 VT/180
0625                        15,3272  0 0006 1          EXTEND
0626   REF   1              15,3273  7 3754 C          MP      1/16A1          = 180/(16 A1 TT )
0627                        15,3274  0 0006 1          EXTEND
0628   REF   7  LAST 1049   15,3275  11'506 1          DV      CALFA
0629   REF 143  LAST 1048   15,3276  54 001 1          TS      L
0630   REF   6  LAST 1049   15,3277  11'614 1          CCS     LCX/360
0631   REF   4  LAST 1049   15,3300  3 4675 1          CAF     POS1/2
0632                        15,3301  1 3303 C          TCF     +2
0633   REF   5  LAST 1049   15,3302  4 4675 C          CS      POS1/2
0634   REF   7  LAST 1049   15,3303  6 1614 C          AD      LCX/360         IS LCX/360 LESS THAN 180 DEG  $
0635   REF 144  LAST 1049   15,3304  6 0001 C          AD      L
0636   REF 145  LAST 1049   15,3305  54 001 1          TS      L
0637   REF   2  LAST 1048   15,3306  1 3313 1          TCF     COMPAT          YES, GO ON.
0638   REF 256  LAST 1046   15,3307  50 000 1  TRTAGXPI INDEX   A               NO, SHIFT X BY - SGN(X) 2 PI
0639   REF   1              15,3310  4 4674 1          CS      HALFPR          +A YIELDS -1/2
0640                        15,3311  6 0000 1          DOUBLE
0641   REF   8  LAST 1049   15,3312  27'614 1          ADS     LCX/360

0642   REF   9  LAST 1049   15,3313  3 1614 C  COMPAT  CA      LCX/360         CORRECT FOR ASSUMED COORD TURN.
0643                        15,3314  0 0006 1          EXTEND
0644   REF   8  LAST 1049   15,3315  7 1506 1          MP      CALFA           COS ALFA
0645   REF  10  LAST 1049   15,3316  55'614 1          TS      LCX/360         SCALED LCX CK HERE.

0646   REF  10  LAST 1049   15,3317  11'700 C          CCS     CMDAPMOD        FOUR POSSIBILITIES HERE
0647   REF   1              15,3320  0 3675 C          TC      DZCALL1         EXIT, SETTING JETAG=0.(C(A)=0)
A0648                                                                         ALL 3 AXES ALREADY DONE.
0649                        15,3321  0 3322 1          TC      +1              G LESS THAN .05. CA POS. CONTINUE
0650   REF  11  LAST 1049   15,3322  3 1614 C          CA      LCX/360         G GEQ .05. CONTINUE IN CM/RCS
0651   REF  12  LAST 1049   15,3323  55'614 1          TS      LCX/360         CMDAPMOD=-0. CAMPING ONLY. SET LCX=0
0652   REF   6  LAST 1046   15,3324  55'713 1          TS      PAXERR1         SAVE LCX FOR FDAI AND EDIT.(  /360)
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0653   REF   5  LAST 1049   15,3325  3 1613 1          CA     -VT/180      GET - 2 VT/180
0654   REF  15  LAST 1049   15,3326  54 021 0          TS     SR
0655   REF  16  LAST 1050   15,3327  3 0021 1          CA     SR           GET -VT/180, LEAVE -VT/360 IN SR FOR DZ
0656   REF   1              15,3330  55'570 0          TS     -VT/180E                  DIAGNOSTIC ****
0657   REF   6  LAST 1050   15,3331  57'613 1          XCH    -VT/180      NOW CONTENTS OF -VT/180 AS LABELED
0658                        15,3332  0 0006 1          EXTEND
0659   REF   7  LAST 1050   15,3333  7 1613 0          MP     -VT/180      B(A) = -2VT/180
0660                        15,3334  0 0006 1          EXTEND
0661   REF   1              15,3335  7 3754 0          MP     180/BATT
0662   REF   2  LAST  109   15,3336  55'616 0          TS     VSQ/4API

R0663     IS SGN(VT) ( (180/4A1 TT) VT/180 VT/180 - .5 BUFLIM/360 )  -X/360     - .5 BUFLIM/360   POS  ?

0665                        15,3337  6 0000 1  WHICHALF DOUBLE                  FOR SECOND BURN,  A1
0666                        15,3340  4 0000 0          COM
0667   REF   1              15,3341  6 3761 1          AD     BUFLIM       =BUFLIM/(2 360)
0668   REF 146  LAST 1049   15,3342  54 001 1          TS     L
0669   REF   8  LAST 1050   15,3343  11'613 0          CCS    -VT/180
0670   REF 147  LAST 1050   15,3344  4 0001 1          CS     L
0671                        15,3345  1 3347 0          TCF    +2
0672   REF 148  LAST 1050   15,3346  3 0001 0          CA     L
0673   REF  13  LAST 1049   15,3347  6 1614 0          AD     LCX/360
0674   REF   2  LAST 1050   15,3350  6 3761 1          AD     BUFLIM
0675                        15,3351  0 0006 1          EXTEND
0676   REF   1              15,3352  6 3367 0          BZMF   REFLECT      POINT (X,V) IN LHP.

R0677     IS SGN(VT) ( (180/4A1 TT) VT/180 VT/180 - .5 BUFLIM/360 )  -X/360     + .5 BUFLIM/360   NEG  ?

0679                        15,3353  4 0000 0          COM
0680   REF   3  LAST 1050   15,3354  6 3761 1          AD     BUFLIM
0681   REF   4  LAST 1050   15,3355  6 3761 1          AD     BUFLIM
0682                        15,3356  0 0006 1          EXTEND
0683   REF   1              15,3357  6 3376 0          BZMF   DZ1          POINT (X,V) IN RHP.

R0684     IS PCINT WITHIN VELOCITY DZ ?

0685   REF   1              15,3360  4 3753 1          CS     VSQMIN       IS VSQ/4API - (VSQ/4API) MIN  NEG  ?
0686   REF   3  LAST 1050   15,3361  6 1616 1          AD     VSQ/4API
0687                        15,3362  0 0006 1          EXTEND
0688   REF   1              15,3363  6 3671 1          BZMF   DZCALL       YES.

R0689          PCINT IS IN BUFFER ZONE. THRUST TO X AXIS.

0690   REF   3  LAST 1048   15,3364  4 1617 1          CS     JNDX
0691   REF   2  LAST  110   15,3365  55'620 0          TS     JNDX1
0692   REF   1              15,3366  0 3451 1          TC     OVRLINE1

0699   REF   9  LAST 1050   15,3367  4 1613 0  REFLECT CS     -VT/180      REFLECT LHP INTO RHP REL TO TERM CONTR
0700   REF  10  LAST 1050   15,3370  55'613 0          TS     -VT/180
0701   REF  17  LAST 1050   15,3371  54 021 0          TS     SR           -VT/360  SAVED FOR DZ.
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0702   REF  14  LAST 1050   15,3372  4 1614 1          CS     LCX/360
0703   REF  15  LAST 1051   15,3373  55'614 1          TS     LCX/360
0704   REF   4  LAST 1050   15,3374  4 1617 1          CS     JNDX
0705   REF   5  LAST 1051   15,3375  55'617 1          TS     JNDX

R0706   IS VSQ/4API - (VSQ/4API) MIN  NEG   $

0707   REF   2  LAST 1050   15,3376  4 3753 1  DZ1     CS     VSQMIN      IS VSQ/4API - (VSQ/4API) MIN  NEG  $
0708   REF   4  LAST 1050   15,3377  6 1616 1          AD     VSQ/4API
0709                        15,3400  0 0006 1          EXTEND
0710   REF   1              15,3401  6 3403 0          BZMF   DZ2         YES, GO TEST FURTHER.
0711   REF   1              15,3402  1 3410 0          TCF    MAXVTEST    NO

R0712   IS X/360 - XMIN/360 -VT/360  NEG  $

0713   REF   1              15,3403  4 3757 0  DZ2     CS     XMIN/360    XMIN/360 = 4/360
0714   REF  16  LAST 1051   15,3404  6 1614 0          AD     LCX/360
0715   REF  18  LAST 1050   15,3405  6 0021 1          AD     SR          C(SR) = -VT/360
0716                        15,3406  0 0006 1          EXTEND             IS X/360 - XMIN/360 -VT/360  NEG  $
0717   REF   2  LAST 1050   15,3407  6 3671 1          BZMF   DZCALL      YES,IN DZ. EXIT SETTING JETAG=0.

R0718   IS XD/360 - VM/360K - XS/360   POS   ?

0719   REF   6  LAST 1051   15,3410  4 1617 1  MAXVTEST CS     JNDX
0720   REF   3  LAST 1050   15,3411  55'620 0          TS     JNDX1       NOW CAN SET JNDX1 FOR TON2 JETS.
0721   REF   1              15,3412  4 3761 0          CS     XS/360      XS/360 = (XMIN -YMIN/K) /360
0722   REF   5  LAST 1051   15,3413  6 1616 1          AD     VSQ/4API
0723   REF  17  LAST 1051   15,3414  6 1614 0          AD     LCX/360
0724   REF   2  LAST  109   15,3415  55'615 0          TS     XD/360      XD/360= X/360 +VSQ/4API   X INTERCEPT
A0725                                                                     BUT C(XD/360) = (XD - XS) /360
0726   REF   1              15,3416  6 3760 0          AD     -VM/360K    X INTERCEPT FOR MAX V (VM)
0727                        15,3417  4 0000 0          COM
0728                        15,3420  0 0006 1          EXTEND
0729   REF   1              15,3421  6 3427 0          BZMF   MAXVTIM1    YES, THRUST TO VM
0730   REF   3  LAST 1051   15,3422  3 1615 1          CA     XD/360
0731                        15,3423  0 0006 1          EXTEND
0732   REF   1              15,3424  7 4675 0          MP     KTRCS
0733                        15,3425  20 001 1          DDOUBL              GO SAVE PREDICTED DRIFTING VELOCITY.

0734   REF   1              15,3426  0 3432 1          TC     GETON1      INSURE THAT Q IS POS AS TAG.
0735                        15,3427  0 0006 1  MAXVTIM1 EXTEND
0736                        15,3430  22 007 0          ZQ                 SET +0 AS TAG
0737   REF   1              15,3431  3 3755 0          CA     VMT/180
0738   REF   1              15,3432  55'567 0  GETON1   TS     VDT/180     VDT/180 OR VMT/180.
0739   REF  11  LAST 1050   15,3433  6 1613 1          AD     -VT/180
0740                        15,3434  6 0000 1          DOUBLE
0741                        15,3435  0 0006 1          EXTEND
0742   REF   2  LAST 1050   15,3436  7 3754 0          MP     180/8ATT
0743   REF   2  LAST  110   15,3437  55'621 1          TS     TON1        TON1 / 4T
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0744                          15,3440  0 0006 1           EXTEND
0745  REF   1                 15,3441  6 3443 1           BZMF    OVRLINE
0746  REF   1                 15,3442  0 3455 C           TC      GETON2          RESET Q POS IF CAME FROM MAXVTIM1

0747  REF 2CE  LAST 1043      15,3443  10 002 1  OVRLINE  CCS     Q
0748  REF   2  LAST 105C      15,3444  1 3451 C           TCF     OVRLINE1
0749  REF   4  LAST 1051      15,3445  3 1620 1  MAXVTIM2 CA      JNDX1           ABOVE VM, SO THRUST DOWN
0750  REF   7  LAST 1051      15,3446  55'617 1           TS      JNDX
0751  REF   3  LAST 1051      15,3447  4 1621 1           CS      TON1
0752  REF   1                 15,3450  1 3454 C           TCF     OVRLINE2 +1

0753  REF  12  LAST 1051      15,3451  4 1613 C  OVRLINE1 CS      -VT/180         DRIFT AT V
0754  REF   2  LAST 1051      15,3452  55'567 C           TS      VDT/180
0755  REF 197  LAST 1045      15,3453  3 4714 1  OVRLINE2 CA      ZERO
0756  REF   4  LAST 1052      15,3454  55'621 1           TS      TON1
0757  REF   3  LAST 1052      15,3455  3 1567 1  GETON2   CA      VDT/180         VDT/180, OR VMT/180 OR VT/180
0758                          15,3456  6 0000 1           DOUBLE
0759                          15,3457  0 0006 1           EXTEND
0760  REF   3  LAST 1051      15,3460  7 3754 C           MP      180/8ATT
0761                          15,3461  6 0000 1           DOUBLE          FOR SECOND BURN, A1
0762  REF   2  LAST  109      15,3462  55'607 C           TS      TON2            = TON2 / 4T

0763                          15,3463  4 0000 C           COM
0764                          15,3464  0 0006 1           EXTEND
0765  REF   1                 15,3465  6 3471 C           BZMF    GETOFF
0766  REF   3  LAST 1052      15,3466  55'607 C           TS      TON2
07661 REF   8  LAST 1052      15,3467  3 1617 C           CA      JNDX
07662 REF   5  LAST 1052      15,3470  55'620 C           TS      JNDX1

0767  REF   4  LAST 1052      15,3471  4 1607 C  GETOFF   CS      TON2            TON2 / 4T
0768                          15,3472  0 0006 1           EXTEND
0769  REF   4  LAST 1052      15,3473  7 1567 C           MP      VDT/180         VDT/180, OR VT/180, OR VMT/180.
0770  REF   4  LAST 1051      15,3474  55'615 C           TS      XD/360          USE AS TEMP
0771  REF   5  LAST 1052      15,3475  4 1567 C           CS      VDT/180
07711                         15,3476  0 0006 1           EXTEND
07712 REF   1                 15,3477  1 3513 1           BZF     TOFFOVFL        OMIT THE DIVIDE IF DEN = 0.
0772  REF  13  LAST 1052      15,3500  6 1613 1           AD      -VT/180
0773                          15,3501  0 0006 1           EXTEND
0774  REF   5  LAST 1052      15,3502  7 1621 1           MP      TON1            TON1 /4T
0775  REF   5  LAST 1052      15,3503  6 1615 1           AD      XD/360          TEMP = -VDT/180 / 2 TON2
0776  REF  18  LAST 1051      15,3504  6 1614 C           AD      LCX/360
0777                          15,3505  22 007 C           ZL
0778  REF 149  LAST 105C      15,3506  56 001 C           XCH     L               TEST THE DIVIDE
0779                          15,3507  0 0006 1           EXTEND
0780  REF   6  LAST 1052      15,3510  11'567 C           DV      VDT/180
0781                          15,3511  0 0006 1           EXTEND
0782  REF   1                 15,3512  1 3515 1           BZF     GETOFF2         DIVIDE OK

0787  REF   1                 15,3513  3 4740 C  TOFFOVFL CA      2JETT           OVFL, USE  2T  FOR CONVENIENCE.
0788  REF   1                 15,3514  1 3522 C           TCF     TIMSCAL
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0796  REF 150  LAST 1052   15,3515  56 001 C  GETOFF2  XCH    L          GET NUMERATOR.
0797                       15,3516  0 0006 1           EXTEND
0798  REF   7  LAST 1052   15,3517  11*567 C           DV     VDT/180    C(A) = TOFF / 2T
0799                       15,3520  0 0006 1           EXTEND
0800  REF   2  LAST 1052   15,3521  7 4740 1           MP     2JETT
0801  REF   2  LAST  109   15,3522  55*605 1  TIMSCAL   TS     TOFF       IN CS

0802  REF   1              15,3523  3 3756 C           CAF    4JETT
0803                       15,3524  0 0006 1           EXTEND
0804  REF   6  LAST 1052   15,3525  7 1621 1           MP     TON1       C(TON1) = TON1 / 4T
0805  REF   7  LAST 1053   15,3526  55*621 1           TS     TON1        IN CS

0806  REF   2  LAST 1053   15,3527  3 3756 C           CAF    4JETT
0807                       15,3530  0 0006 1           EXTEND
0808  REF   5  LAST 1052   15,3531  7 1607 C           MP     TON2       C(TON2) = TON2 / 4T
0809  REF   6  LAST 1053   15,3532  55*607 C           TS     TON2       IN CS

0810  REF 198  LAST 1052   15,3533  3 4714 1           CA     ZERO       CANNOT REDO AFTER TIMETST. TUSED GONE
0811  REF   9  LAST 1048   15,3534  55*711 C           TS     JETAG      SET +0 TO SHOW ROLL DAP CALLED.

A0812                                                                   CAUSE THE TM OF BODY RATES VIA UPBUFF TO BE
A0813                                                                   INITIALIZED. ALSO CAUSE NEEDLES TO BE DONE ON NEXT
A0814                                                                   AND ON ALTERNATE PASSES THROUGH CM/DUMPR.

0815  REF 125  LAST 1049   15,3535  3 4712 1           CA     ONE
0816  REF   2  LAST 1036   15,3536  54 305 C           TS     SW/NDX
```

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P0817   TIMETEST SECTION FOR RCS
R0818   ENTER WITH THREE TIME INTERVALS AND THE CORRESPONDING JET CODE INDEXES IN ERASEABLE LOCS TON1, TOFF, TON2, JNDX
R0820   JNDX1.  SECTION PROCESSES TIME INTERVALS FOR WTLST CALLS AND ASSURES THAT WTLST CALLS ARE MADE ONLY
R0822   (1) FOR POS INTERVALS GREATER THAN A SPECIFIED MINIMUM ( HERE CHOSEN AS  2 CS) AND
R0824   (2) FOR THE INTERVALS THAT WILL BE EXECUTED WITHIN THE TIME REMAINING IN THE SAMPLE INTERVAL T  (2 SEC).
R0826   TIMETST  ESTABLISHES 6 LOCS CONTAINING JET CODES AND CORRESPONDING TIME  INTERVALS. THUS: TON1, T1BITS,
R0828   TOFF, T8ITS,  TON2, T2BITS.   OF THESE THE FIRST 2 LOCS ARE TEMPORARY, FOR IMMEDIATE ACTION, IN GENERAL.
R0830   SECTION JETCALL  BELOW PROCESSES THIS LIST.

 0831   REF  16  LAST 1048   15,3537  3 0025 0  TIMETST  CA    TIME1     CORRECT FOR POSSIBLE TIME1 OVFL.
 0832   REF   6  LAST 1049   15,3540  6 4675 1           AD    POS1/2
 0833   REF   7  LAST 1054   15,3541  6 4675 1           AD    POS1/2    OVFL GUARANTEED.
 0834   REF   3  LAST 1048   15,3542  27'712 0           ADS   TUSED     B(TUSED) =-TUSED =-OLTIME1

 0835   REF   1              15,3543  3 3752 1           CA    -T-3      =-T +2 -5  (SEE SETJTAG)
A0836                                                                   THE +2 REQUIRED FOR PROPER BRANCH.
 0837   REF   4  LAST 1054   15,3544  27'712 0           ADS   TUSED     TUSED = TIME(K)-TIME(K-1)-T+2

 0838   REF  48  LAST 1011   15,3545  4 4711 0           CS    TWO       USE 2 SINCE TIME3 UNCERTAIN TO 1
 0839   REF   8  LAST 1053   15,3546  6 1621 0           AD    TON1
 0840                        15,3547  0 0006 1           EXTEND
 0841   REF   1              15,3550  6 3562 0           BZMF  TIMETST1
 0842   REF   9  LAST 1052   15,3551  51'617 0           INDEX JNDX
 0843   REF   3  LAST 1046   15,3552  3 3220 1           CAF   P/RJCODE
 0844   REF   2  LAST  110   15,3553  55'622 1           TS    T1BITS

 0845   REF   9  LAST 1054   15,3554  3 1621 0           CA    TON1
 0846   REF   5  LAST 1054   15,3555  27'712 0           ADS   TUSED
 0847                        15,3556  0 0006 1           EXTEND
 0848   REF   1              15,3557  6 3564 0           BZMF  TOFFTEST
 0849   REF 199  LAST 1053   15,3560  3 4714 1           CA    ZERO
 0850   REF   1              15,3561  1 3615 1           TCF   TIMETST3
 0851   REF 126  LAST 1053   15,3562  4 4712 0  TIMETST1 CS    ONE
 0852   REF  10  LAST 1054   15,3563  55'621 1           TS    TON1
 0853   REF  49  LAST 1054   15,3564  4 4711 0  TOFFTEST CS    TWO
 0854   REF   3  LAST 1053   15,3565  6 1605 0           AD    TOFF
 0855                        15,3566  0 0006 1           EXTEND
 0856   REF   1              15,3567  6 3576 0           BZMF  TIMETST2
 0857   REF   4  LAST 1054   15,3570  3 1605 0           CA    TOFF
 0858   REF   6  LAST 1054   15,3571  27'712 0           ADS   TUSED
 0859                        15,3572  0 0006 1           EXTEND
 0860   REF   1              15,3573  6 3600 1           BZMF  TON2TEST
 0861   REF 200  LAST 1054   15,3574  3 4714 1           CA    ZERO
 0862   REF   1              15,3575  1 3617 0           TCF   TIMETST4
 0863   REF 127  LAST 1054   15,3576  4 4712 0  TIMETST2 CS    ONE
 0864   REF   5  LAST 1054   15,3577  55'605 1           TS    TOFF
 0865   REF  50  LAST 1054   15,3600  4 4711 0  TON2TEST CS    TWO
 0866   REF   7  LAST 1053   15,3601  6 1607 1           AD    TON2
 0867                        15,3602  0 0006 1           EXTEND
 0868   REF   1              15,3603  6 3620 0           BZMF  TIMETST5
```

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0869   REF   6  LAST 1052   15,3604  51'620 1            INDEX  JNDX1
0870   REF   4  LAST 1054   15,3605  3 3220 1            CAF    P/RJCODE
0871   REF   2  LAST  105   15,3606  55'610 0            TS     T2BITS
0872   REF   8  LAST 1054   15,3607  3 1607 1            CA     TON2
0873   REF   7  LAST 1054   15,3610  27'712 0            ADS    TUSED
0874                        15,3611  0 0006 1            EXTEND
0875   REF   1              15,3612  6 3622 1            BZMF   JETCALL1
0876   REF 201  LAST 1054   15,3613  3 4714 1            CA     ZERO
0877   REF   2  LAST 1054   15,3614  1 3621 0            TCF    TIMETST5 +1
0878   REF  11  LAST 1054   15,3615  55'621 1  TIMETST3  TS     TON1
0879   REF 128  LAST 1054   15,3616  4 4712 0            CS     ONE
0880   REF   6  LAST 1054   15,3617  55'605 1  TIMETST4  TS     TOFF
0881   REF 129  LAST 1055   15,3620  4 4712 0  TIMETST5  CS     ONE
0882   REF   9  LAST 1055   15,3621  55'607 0            TS     TON2

R0883  SECTION  JETCALL  EXAMINES CONTENTS OF JET TIMES IN LIST, ESTABLISHES WTLST ENTRIES, AND EXECUTES CORRESPONDING
R0885  JET CODES. A POSITIVE NZ NUMBER IN A TIME REGISTER INDICATES THAT A WTLST CALL IS TO BE MADE, AND ITS JET BITS
R0887  EXECUTED. A +0 INDICATES THAT THE TIME INTERVAL DOES NOT APPLY, BUT THE  CORRESPONDING JET BITS ARE TO BE
R0889  EXECUTED. A NEG NUMBER INDICATES THAT THE TIME INTERVAL HAS BEEN PROCESSED. IN EVENT OF +0 OR -1, THE
R0891  SUBSEQUENT TIME REGISTER IS EXAMINED FOR POSSIBLE ACTION. THUS JET BITS TO BE EXECUTED MAY COME FROM MORE
R0893  THAN ONE REGISTER.

0894   REF 202  LAST 1055   15,3622  3 4714 1  JETCALL1 CA     ZERO
0895   REF   2  LAST  109   15,3623  55'611 1            TS     OUTTAG
0896   REF   2  LAST  109   15,3624  55'612 1            TS     NUJET
0897   REF   2  LAST  109   15,3625  55'606 1            TS     TBITS
0898   REF  12  LAST 1055   15,3626  53'622 1            DXCH   TON1
0899   REF 257  LAST 1049   15,3627  10 000 0            CCS    A
0900   REF   1              15,3630  1 3645 1            TCF    JETCALL2        CALL WTLST
0901   REF   3  LAST 1055   15,3631  23'612 0  JETCALL3  LXCH   NUJET          WTLST ENTRIES COME HERE FROM JETCALL
0902   REF 130  LAST 1055   15,3632  4 4712 0            CS     ONE
0903   REF   7  LAST 1055   15,3633  53'606 1            DXCH   TOFF
0904   REF 258  LAST 1055   15,3634  10 000 0            CCS    A
0905   REF   2  LAST 1055   15,3635  1 3645 1            TCF    JETCALL2        CALL WTLST
0906   REF   4  LAST 1055   15,3636  23'612 0            LXCH   NUJET
0907   REF 131  LAST 1055   15,3637  4 4712 0            CS     ONE
0908   REF  10  LAST 1055   15,3640  53'610 0            DXCH   TON2
0909   REF 259  LAST 1055   15,3641  10 000 0            CCS    A
0910   REF   3  LAST 1055   15,3642  1 3645 1            TCF    JETCALL2        CALL WTLST
0911   REF   5  LAST 1055   15,3643  23'612 0            LXCH   NUJET
0912   REF   1              15,3644  0 3654 0            TC     JETACTN         C(A) = +0
0913   REF 151  LAST 1053   15,3645  56 001 0  JETCALL2  XCH    L               SAVE JET BITS FOR AFTER WTLST CALL
0914   REF   6  LAST 1055   15,3646  27'612 1            ADS    NUJET
0915   REF 152  LAST 1055   15,3647  56 001 0            XCH    L
0916   REF 132  LAST 1055   15,3650  6 4712 1            AD     ONE             RESTORE FOR CCS
0917   REF  48  LAST 1044   15,3651  0 5140 1            TC     WAITLIST
0918   REF  40  LAST 1044   E6,1661                       EBANK= ADG
0919   REF   1              15,3652   03662 0           2CADR  JETCALL
0919   REF   1              15,3653   32066 0
0920   REF   7  LAST 1055   15,3654  3 1612 0  JETACTN   CA     NUJET           COME HERE WHEN DESIRED JET CODE IS KNOWN
```

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0921                        15,3655  0 0006 1          EXTEND                NO NEED TO SAVE OLD CODES
0922  REF   4  LAST 1046    15,3656  01 006 0          WRITE  ROLLJETS       SET RCHAN TO NEW BIT CONFIG.

0923  REF   3  LAST 1055    15,3657  11'611 1          CCS    OUTTAG
0924  REF  55  LAST 1048    15,3660  0 5213 1          TC     TASKOVER
0925  REF   1               15,3661  0 3711 0 ROLLDUMP TC     CM/FDAIR

A0926                                                        EDIT DUMP AT ABOVE LOCATION.

R0927   WAITLIST ENTRIES COME HERE.

0928  REF  42  LAST  979    15,3662  3 4711 1 JETCALL  CAF    BIT2            CM/DSTBY =103D BIT2
0929  REF   4  LAST 1056    15,3663  55'611 1          TS     OUTTAG          SIGNIFY WTLST ENTRY
0930  REF  23  LAST 1048    15,3664  7 0102 0          MASK   CM/FLAGS        IS SYSTEM DISABLED  $
0931                        15,3665  0 0006 1          EXTEND
0932  REF   2  LAST 1055    15,3666  1 3655 0          BZF    JETACTN +1      YES, QUENCH ROLL JETS,IF ON AND EXIT.
0933                        15,3667  22 007 0          ZL                     NO, CONTINUE.
0934  REF   1               15,3670  1 3631 1          TCF    JETCALL3        C(A) POS, C(L) =+0

R0935    DEAD ZONE ENTRIES COME HERE.

0936  REF 203  LAST 1055    15,3671  3 4714 1 DZCALL   CA     ZERO            COME HERE IF IN DZ, AND CANCELL JETS
0937                        15,3672  0 0006 1          EXTEND                 INHINT NOT NEEDED HERE.
0938  REF   5  LAST 1056    15,3673  01 006 0          WRITE  ROLLJETS        TURN OFF ALL ROLL JETS.
0939  REF   8  LAST 1053    15,3674  55'567 0          TS     VDT/180         SET =0 TO SHOW IN DEAD ZONE.
0940  REF  10  LAST 1053    15,3675  55'711 0 DZCALL1  TS     JETAG           COME HERE WITH C(A)=0.
0941  REF   1               15,3676  0 3661 0          TC     ROLLDUMP
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P0942    CM ENTRY FDAI DISPLAY

R0943    CALCULATE BY INTEGRATION THE ROLL ERROR BETWEEN THE 2 SEC CM/RCS UPDATES . DISPLAY ATTITUDE ERRORS AS FOLLOWS:
R0945              ATM DAP:    DISPLAY ONLY ROLL ATTITUDE ERROR.
R0946              EXT ATM DAP:    PRESENT 3 ATTITUDE ERRORS RELATIVE TO THE APPROPRIATE BODY AXES EACH .1 SEC.
R0948                                        ROLL    ROLLC-ROLL
R0949                                        PITCH   ALFAC-ALFA
R0950                                        YAW     BETAC-BETA

R0951    DURING ENTRY, THE FDAI NEEDLES HAVE FULL SCALE OF 67.5 DEG IN ROLL AND  16.875 DEG IN PITCH AND YAW.
R0953    THE SUBROUTINE  NEEDLER  EXPECTS (ANGLE/180) AND SCALES TO 16.875 DEG   FULL SCALE.

 0955   REF  11  LAST 1049   15,3677  11'700 0  CM/FDAI  CCS     CMDAPMOD        COME HERE EACH 0.1 SEC.
 0956   REF   2  LAST 105E   15,3700  1 3710 0           TCF     CM/FDAIR -1      C(A) =0, FOR DUMP.
 0957                        15,3701  1 3703 1           TCF     +2
 0958                        15,3702  1 3703 1           TCF     +1              (IN ATM, COME HERE TO   )
 0959   REF   7  LAST 1042   15,3703  4 1705 0           CS      PHIDOT          INTEGRATE ROLL ERROR.BETWEEN 2 SEC
 0960                        15,3704  0 0006 1           EXTEND
 0961   REF   9  LAST 1049   15,3705  7 1506 1           MP      CALFA           FOR ASSUMED COORDINATION.
 0962                        15,3706  0 0006 1           EXTEND
 0963   REF   6  LAST 1046   15,3707  7 4675 0           MP      HALF
 0964   REF   7  LAST 1049   15,3710  27'713 1           ADS     PAXERR1         ROLL ERROR/360.    OVFL OK.

A0965                                                                EDIT DUMP AT ABOVE LOCATION.
 0966   REF   7  LAST 1057   15,3711  3 4675 1  CM/FDAIR CA      HALF
 0967                        15,3712  0 0006 1           EXTEND
 0968   REF   8  LAST 1057   15,3713  7 1713 1           MP      PAXERR1         FULL SCALE FOR FDAI (ROLL) IS 67.5 D
 0969   REF   1              15,3714  55'476 1           TS      PAXERR          .25 (ROLL ERROR/180) FOR FDAI NEEDLE.

A0970                                                                PROGRAM TO FILE BODY  RATES FOR TM ON ONE PASS AND
A0971                                                                TO UPDATE THE NEEDLE DISPLAY ON THE NEXT.
A0972                                                                SYNCHRONIZATION WITH CM/RCS IS USED SO THAT THE TM
A0973                                                                IS DONE WITH THE ROLL SYSTEM AND NEEDLES START ON
A0974                                                                THE SUBSEQUENT PASS.
A0975

 0976   REF   3  LAST 1053   15,3715  4 0305 0  CM/DUMPR CS      SW/NDX          COMBINED ALTERNATION SWITCH AND FILE
 09761  REF   4  LAST 1057   15,3716  54 305 0           TS      SW/NDX
 0977                        15,3717  0 0006 1           EXTEND                  INDEX.
 0978   REF   1              15,3720  6 3724 0           BZMF    CMTMFILE        FILE STARTS WITH SW/NDX +1 AND GOES TO
A0979                                                                ENDBUF.
A0980                                                                INDEX IS POS FOR NEEDLES

 0981   REF  39  LAST  982   15,3721  0 4633 0           TC      IBNKCALL
 0982   REF   9  LAST  98C   15,3722   42404 1           CADR    NEEDLER

 0983   REF   1              15,3723  0 3742 0           TC      CM/END

A0984                                                                INDEX IS NEG FOR TM FILE
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0985  REF  39  LAST 1032   15,3724  6 6214 C  CMTMFILE AD      THREE
0986                       15,3725  0 0006 1            EXTEND
0987  REF   1              15,3726  6 3732 1            BZMF    SAVENDX

0988  REF  17  LAST 1054   15,3727  3 0025 0            CA      TIME1          INITIALIZE THE TM LIST IN UPBUFF.
0989  REF   3  LAST   69   15,3730  54 304 1            TS      CMTMTIME
0990  REF   3  LAST  822   15,3731  4 4720 1            CS      THIRTEEN        INITIALIZE COUNTER
0991  REF   5  LAST 1057   15,3732  54 305 C  SAVENDX    TS      SW/NDX         A NEGATIVE NUMBER.
0992                       15,3733  0 0006 1            EXTEND
0993  REF   7  LAST 1048   15,3734  3 1702 0            DCA     PREL
0994  REF   6  LAST 1058   15,3735  50 305 1            INDEX   SW/NDX
0995  REF   2  LAST   69   15,3736  52 324 C            DXCH    ENDBUF -1
0996  REF   7  LAST 1049   15,3737  3 1703 1            CA      RREL
0997  REF   7  LAST 1058   15,3740  50 305 1            INDEX   SW/NDX
0998  REF   3  LAST 1058   15,3741  54 325 1            TS      ENDBUF +1

0999  REF   3  LAST 1041   15,3742  3 1623 1  CM/END    CA      CM/SAVE
1000  REF  19  LAST 1051   15,3743  54 021 C            TS      SR
A1001                                                        DOES NOT PROTECT TEMK, SQ IN SPSIN/COS

1002                       15,3744  0 0006 1            EXTEND
1003  REF   1              15,3745  3 3751 1            DCA     T5IDLER2
1004  REF  25  LAST 1040   15,3746  53'313 C            DXCH    T5LOC
1005  REF  46  LAST 1030   15,3747  0 5222 C            TC      RESUME

1006  REF  26  LAST 1058        1312                    EBANK= T5LOC
1007  REF   7  LAST 1037   15,3750  03132 1  T5IDLER2 2CADR  T5IDLOC
1007                       15,3751  12062 C

A1008                                                   DEFINE THE FOLLOWING 170 REGISTERS IN UPBUFF TO BE
A1009                                                   USED TO TELEMETER CM VEHICLE BODY RATE INFORMATION.
A1010                                                   THE INFORMATION IS FILED EACH 0.2 SEC, GIVING 150
A1011                                                   DATA POINTS EACH 1 SEC.  TM LIST IS READ TWICE
A1012                                                   EACH 2 SECONDS.

A1013                                                   THE SEQUENCE IS:   SP TIME      INITIAL TIME
A1014                                                                      SWITCH       ALSO INDEX.
A1015                                                                      P            ROLL RATE
A1016                                                                      Q            PITCH RATE
A1017                                                                      R            YAW RATE
A1018                                                                      ETC.

A1019                                          CMTMTIME =     UPBUFF
A1020                                          SW/NDX   =     UPBUFF  +1
A1021                                          ENDBUF   =     UPBUFF  +160

R1022  CONSTANTS USED IN THE ROLL CONTROL SYSTEM:
R1023  CONSTANTS ARE THE FOLLOWING: A = 9.1 DEG/SECSQ, VM = 20 DEG/SEC,        T = 2 SEC,  TCDU = .1 SEC,
R1025  XMIN = 4 DEG, VMIN = 2 DEG/SEC, K = .25, A1 = 4.55 DEG/SECSQ,           VI = 1 DEG/SEC, INTERCEPT WITH DZ SIDE
R1027  XBUF = 4 DEG
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 1028                          15,3752   77464 1  -T-3      DEC    -203              CS
 1029                          15,3753   00012 1  VSQMIN    DEC    .61050061 E-3     VSQ MIN/4 A PI = 4/(4  (9.1)  180)
 1030  REF  3 LAST 263           4726             2T/TCDU   =      OCT50             T/TCDU  EXP-14   TCDU =.1SEC
 1031                          15,3754   23617 0  180/8ATT  DEC    .61813187         180/(8  (9.1) 4)=(180/ATT)  EXP -3
 1032                          15,3755   07071 0  VMT/180   DEC    .222222222        20 (2) / 180
 1033  REF  3 LAST 574           4740             2JETT     =      4SECS             CS            2 (2) 100   INTEGER
 1034                          15,3756   01440 0  4JETT     DEC    800               CS            4 (2) 100   INTEGER
 1035                          15,3757   00266 0  XMIN/360  DEC    182               XMIN/360 = 4/ 360  EXP 14  = 182 INTEGER
 1036                          15,3760   70706 1  -VM/360K  DEC    -.22222222        =-20/( 360  (.25))
 1037  REF  4 LAST 1052        15,3754            1/16A1    =      180/8ATT
A1037                                                                1/16A1  = 180/(16 A1 TT)
A1038                                                                =180/(16  4.55  4)
 1039                          15,3761   00133 0  XS/360    DEC    91                =(XMIN +VI (T-1/K))/360 = 2/360 EXP 14
 1040  REF  2 LAST 1051        15,3761            BUFLIM    =      XS/360            4/(2  360)

 1041  REF  8 LAST 1057          4675             KTRCS     =      HALF              KT = (.25) 2 = .5


*** END OF DAPCSM .186 ***
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R0001   PROGRAM NAME- DOWN TELEMETRY PROGRAM
R0002   MOD NO.- 0      TO COMPLETELY REWRITE THE DOWN TELEMETRY PROGRAM AND DOWNLINK ERASABLE DUMP PROGRAM FOR THE
R0004                   PURPOSE OF SAVING APPROXIMATELY 150 WORDS OF CORE STORAGE.
R0006                   THIS CHANGE REQUIRES AN ENTIRELY NEW METHOD OF SPECIFYING DOWNLINK LISTS.REFER TO DOWNLINK
R0008                   LISTS LOG SECTION FOR MORE DETAILS. HOWEVER THIS CHANGE WILL NOT AFFECT THE GROUND PROCESSING
R0010                   OF DOWN TELEMETRY DATA.
R0011   MOD BY- KILROY, SMITH, DEWITT
R0012   DATE-   020CT67
R0013   AUTHORS- KILROY, SMITH, DEWITT, DEWOLF, FAGIN
R0014   LOG SECTION- DOWN-TELEMETRY PROGRAM
R0015   FUNCTIONAL DESCRIPTION- THIS ROUTINE IS INITIATED BY TELEMETRY END
R0016           PULSE FROM THE DOWNLINK TELEMETRY CONVERTER. THIS PULSE OCCURS
R0017           AT 50 TIMES PER SEC(EVERY 20 MS) THEREFORE DODOWNTM IS
R0018           EXECUTED AT THESE RATES. THIS ROUTINE SELECTS THE APPROPRIATE
R0019           AGC DATA TO BE TRANSMITTED DOWNLINK AND LOADS IT INTO OUTPUT
R0020           CHANNELS 34 AND 35. THE INFORMATION IS THEN GATED OUT FROM THE
R0021           LGC IN SERIAL FASHION.
R0022           THIS PROGRAM IS CODED FOR A 2 SECOND DOWNLIST. SINCE DOWNRUPTS
R0023           OCCUR EVERY 20MS AND 2 AGC COMPUTER WORDS CAN BE PLACED IN
R0024           CHANNELS 34 AND 35 DURING EACH DOWNRUPT THE PROGRAM IS CAPABLE
R0025           OF SENDING 200 AGC WORDS EVERY 2 SECONDS.
R0026   CALLING SEQUENCE- NONE
R0027           PROGRAM IS ENTERED VIA TCF DODOWNTM WHICH IS EXECUTED AS A
R0028           RESULT OF A DOWNRUPT. CONTROL IS RETURNED VIA TCF RESUME WHICH
R0029           IN EFFECT IS A RESUME.
R0030   SUBROUTINES CALLED- NONE
R0031   NORMAL EXIT MODE- TCF RESUME
R0032   ALARM OR ABORT EXIT MODE- NONE
R0033   RESTART PROTECTION:
R0034           ON A FRESH START AND RESTART THE 'STARTSUB' SUBROUTINE WILL INITIALIZE THE DOWNLIST POINTER(ACTUALLY
R0036           DNTMGOTO) TO THE BEGINNING OF THE CURRENT DOWNLIST(I.E. CURRENT CONTENTS OF DNLSTADR). THIS HAS THE
R0038           EFFECT OF IGNORING THE REMAINDER OF THE DOWNLIST WHICH THE DOWN-TELEMETRY PROGRAM WAS WORKING ON WHEN
R0040           THE RESTART(OR FRESH START) OCCURRED AND RESUME DOWN TELEMETRY FROM THE BEGINNING OF THE CURRENT
R0042           DOWNLIST.
R0043           ALSO OF INTEREST IS THE FACT THAT ON A RESTART THE AGC WILL ZERO DOWNLINK CHANNELS 13, 34 AND 35.
R0047   DOWNLINK LIST SELECTION:
R0048           THE APPROPRIATE DOWNLINK LISTS ARE SELECTED BY THE FOLLOWING:
R0049           1. FRESH START
R0050           2. V37EXXE  WHERE XX = THE MAJOR MODE BEING SELECTED.
R0051           3. UPDATE PROGRAM(P27)
R0052           4.      NON-V37 SELECTABLE TYPE PROGRAMS(E.G. AGS INITIALIZATION(SUNDANCE,LUMINARY) AND P61-P62
R0052           2       TRANSITION(COLOSSUS) ETC.).
R0052   DOWNLINK LIST RULES AND LIMITATIONS:
R0052           READ SECTION(S) WHICH FOLLOW 'DEBRIS' WRITEUP.
R0053   OUTPUT- EVERY 2 SECONDS 100 DOUBLE PRECISION WORDS(I.E. 200 LGC
R0054           COMPUTER WORDS) ARE TRANSMITTED VIA DOWNLINK.
R0055   ERASABLE INITIALIZATION REQUIRED- NONE
R0056           'DNTMGOTO' AND 'DNLSTADR' ARE INITIALIZED BY THE FRESH START PROGRAM.
R0058   DEBRIS(ERASABLE LOCATIONS DESTROYED BY THIS PROGRAM)-
R0059           LOCATALST,DNTMBUFF TO DNTMBUFF +21D,TMINDEX,DNC.
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R0060

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R0065   DOCDWNTM IS ENTERED EVERY 20 MS BY AN INTERRUPT TRIGGERED BY THE
R0066   RECEIPT OF AN ENDPULSE FROM THE SPACECRAFT TELEMETRY PROGRAMMER.

R0067   NOTES REGARDING DOWNLINK LISTS ASSOCIATED WITH THIS PROGRAM:
R0068   1. DOWNLISTS. - DOWNLISTS MUST BE COMPILED IN THE SAME BANK AS THE
R0069      DOWN-TELEMETRY PROGRAM. THIS IS DONE FOR EASE OF CODING, FASTER
R0070      EXECUTION.
R0075   2. EACH DOWNLINK LIST CONSISTS OF A CONTROL LIST AND A NUMBER OF
R0076      SUBLISTS.
R0077   3. A SUBLIST REFERS TO A SNAPSHOT OR DATA COMMON TO THE SAME OR OTHER
R0078      DOWNLINK LISTS.  ANY SUBLIST CONTAINING COMMON DATA NEEDS TO BE
R0079      CODED ONLY ONCE FOR THE APPLICABLE DOWNLINK LISTS.
R0080   4. SNAPSHOT SUBLISTS REFER SPECIFICALLY TO HOMOGENOUS DATA WHICH MUST BE
R0081      SAVED IN A BUFFER DURING ONE DOWNRUPT.
R0082   5. THE 1DNADR FOR THE 1ST WORD OF SNAPSHOT DATA IS FOUND AT THE END
R0083      OF EACH SNAPSHOT SUBLIST, SINCE THE PROGRAM CODING SENDS THIS DP WORD
R0084      IMMEDIATELY AFTER STORING THE OTHERS IN THE SNAPSHOT BUFFER.
R0085   6. ALL LISTS ARE COMBINATIONS OF CODED ERASABLE ADDRESS CONSTANTS
R0086      CREATED FOR THE DOWNLIST PROGRAM.
R0087      A. 1DNADR                1-WORD DOWNLIST ADDRESS.
R0088         SAME AS ECADR, BUT USED WHEN THE WORD ADDRESSED IS THE LEFT
R0089         HALF OF A DOUBLE-PRECISION WORD FOR DOWN TELEMETRY.
R0090      B. 2DNADR - 6DNADR      N-WORD DOWNLIST ADDRESS, N = 2 - 6.
R0091         SAME AS 1DNADR, BUT WITH THE 4 UNUSED BITS OF THE ECADR FORMAT
R0092         FILLED IN WITH 0001-0101.  USED TO POINT TO A LIST OF N DOUBLE-
R0093         PRECISION WORDS, STORED CONSECUTIVELY, FOR DOWN TELEMETRY.
R0094      C. DNCHAN                DOWNLIST CHANNEL ADDRESS.
R0095         SAME AS 1DNADR, BUT WITH PREFIX BITS 0111.  USED TO POINT TO
R0096         A PAIR OF CHANNELS FOR DOWN TELEMETRY.
R0097      D. DNPTR                 DOWN TELEMETRY SUBLIST POINTER.
R0098       SAME AS CAF BUT TAGGED AS A CONSTANT. USED IN CONTROL LIST TO POINT TO A SUBLIST.
R0100       CAUTION--- A DNPTR CANNOT BE USED IN A SUBLIST.
R0101   7. THE WORD ORDER CODE IS SET TO ZERO AT THE BEGINNING OF EACH DOWNLIST (I.E. CONTROL LIST) AND WHEN
R0103      A '1DNADR TIME2' IS DETECTED IN THE CONTROL LIST(ONLY).
R0104   8. IN THE SNAPSHOT SUBLIST ONLY, THE DNADR'S CANNOT POINT TO THE FIRST WORD OF ANY EBANK.

R0106   DOWNLINK LIST RESTRICTIONS:
R0107     (THE FOLLOWING POINTS MAY BE LISTED ELSEWHERE BUT ARE LISTED HERE SO  IT IS CLEAR THAT THESE THINGS CANNOT BE
R0109     DONE)

R0110   1. SNAPSHOT DOWNLIST:
R0111      (A) CANNOT CONTAIN THE FOLLOWING ECADRS(I.E. 1DNADR'S): 0, 400, 1000, 1400, 2000, 2400, 3000, 3400.
R0113      (B) CAN CONTAIN ONLY 1DNADR'S

R0114   2. ALL DOWNLINKED DATA(EXCEPT CHANNELS) IS PICKED UP BY A <DCA<SQ DOWNLINK LISTS CANNOT CONTAIN THE
R0116      EQUIVALENT OF THE FOLLOWING ECADRS(I.E. 1DNADRS): 377, 777, 1377, 1777, 2377, 27777, 3377, 3777.

R0118      (NOTE: THE TERM EQUIVALENT ' MEANT THAT THE 1DNADR  TO 6DNADR  WILL BE PROCESSED LIKE 1 TO 6 ECADRS)

R0120   3. CONTROL LISTS AND SUBLISTS CANNOT HAVE ENTRIES = OCTAL 00000 OR OCTAL 77777
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R0122   4. THE '1DNADR TIME2' WHICH WILL CAUSE THE DOWNLINK PROGRAM TO SET THE WORDER CODE TO 3 MUST APPEAR IN THE
R0124      CONTROL SECTION OF THE DOWNLIST.

R0125   5. 'DNCHAN 0' CANNOT BE USED.

R0126   6. 'DNPTR C' CANNCT BE USED.

R0127   7. DNPTR CANNCT APPEAR IN A SUBLIST.

R0128


R0129   EBANK SETTINGS
R0130             IN THE PROCESS OF SETTING THE EBANK(WHEN PICKING UP DOWNLINK DATA) THE DOWN TELEMETRY PROGRAM PUTS
R0132             'GARBAGE' INTO BITS15-12 OF EBANK. HUGH BLAIR-SMITH WARNS US THAT BITS15-12 OF EBANK MAY BECOME
R0134             SIGNIFICANT SOMEDAY IN THE FUTURE. IF/WHEN THAT HAPPENS, THE PROGRAM SHOULD INSURE(BY MASKING ETC.)
R0136             THAT BITS15-12 OF EBANK ARE ZERO.
R0137   INITIALIZATION REQUIRED- TO INTERRUPT CURRENT LIST AND START A NEW ONE..
R0138        1.   ADRES OF DOWNLINK LIST INTO DNLSTADR
R0139        2.   NEGONE INTO SUBLIST
R0140        3.   NEGONE INTO DNECADR

 0142                          22,3505                          BANK    22
 0143   REF   2 LAST  165      05,2000                          SETLOC DOWNTELM
 0144                          05,3331                          BANK

 0145   REF  23 LAST  174       0340                           EBANK= DNTMBUFF

 0146   REF   1                                                COUNT  05/DPROG

 0147   REF  21 LAST 1041      05,3331  54 016 1  DODOWNTM TS      BANKRUPT
 0148                          05,3332  0 0006 1          EXTEND
 0149   REF  17 LAST 1041      05,3333  22 012 1          QXCH    QRUPT       SAVE Q
 0150   REF  47 LAST 1025      05,3334  3 4704 C          CA      BIT7        SET WORD ORDER CODE TO 1. EXCEPTION- AT
 0151                          05,3335  0 0006 1          EXTEND              THE BEGINNING OF EACH LIST THE WORD
 0152   REF  12 LAST 103C      05,3336  05 013 C          WOR     CHAN13      CODE WILL BE SET BACK TO 0.
 0153   REF   3 LAST  253      05,3337  0 0335 1          TC      DNTMGOTO    GO TO APPROPRIATE PHASE OF PROGRAM

 0154   REF  19 LAST  933      05,3340  3 7716 C  DNPHASE1 CA      NEGONE      INITIALIZE ALL CONTROL WORDS
 0155   REF   1                05,3341  54 337 1          TS      SUBLIST     WORDS TO MINUS ONE
 0156   REF   1                05,3342  54 336 C          TS      DNECADR
 0157   REF   1                05,3343  3 3463 C          CA      LDNPHAS2    SET DNTMGOTO =0 ALL SUBSEQUENT DOWNRUPTS
 0158   REF   4 LAST 1063      05,3344  54 335 C          TS      DNTMGOTO    GO TO DNPHASE2
 0159   REF   1                05,3345  1 3361 1          TCF     NEWLIST
 0160   REF   2 LAST 1063      05,3346  10 336 0  DNPHASE2 CCS     DNECADR     SENDING OF DATA IN PROGRESS
 0161   REF   1                05,3347  0 3476 1  DODNADR  TC      FETCH2WD    YES - THEN FETCH THE NEXT 2 SP WORDS
 0162   REF  27 LAST  783      05,3350   77753 C  MINTIME2-1DNADR TIME2         NEGATIVE OF TIME2 1DNADR
 0163                          05,3351  1 3352 1          TCF     +1          (ECADR OF  3776 + 74001 = 77777)

 0164   REF   2 LAST 1063      05,3352  10 337 1          CCS     SUBLIST     IS THE SUBLIST IN CONTROL
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0165  REF   1                05,3353  1 3511 C            TCF     NEXTINSL        YES
0166                         05,3354   74001 0  DNADRDCR  OCT     74001           DNADR COUNT AND ECADR DECREMENTER

0167  REF   1                05,3355  3 0334 C  CHKLIST   CA      CTLIST
0168                         05,3356  0 0006 1            EXTEND
0169  REF   2  LAST 1063    05,3357  6 3361 C            BZMF    NEWLIST         IT WILL BE NEGATIVE AT END OF LIST
0170  REF   1                05,3360  1 3366 C            TCF     NEXTINCL
0171  REF   5  LAST  743     05,3361  50 332 C  NEWLIST   INDEX   DNLSTCOD
0172  REF   1                05,3362  3 2342 C            CA      DNTABLE         INITIALIZE CTLIST WITH
0173  REF   2  LAST 1064     05,3363  54 334 1            TS      CTLIST            STARTING ADDRESS OF NEW LIST
0174  REF   6  LAST 1064     05,3364  4 0332 1            CS      DNLSTCOD
0175  REF   1                05,3365  1 3601 1            TCF     SENDID +3
0177  REF   3  LAST 1064     05,3366  50 334 C  NEXTINCL  INDEX   CTLIST
0178                         05,3367  3 0000 1            CA      0
0179  REF 260  LAST 1055     05,3370  10 000 C            CCS     A
0180  REF   4  LAST 1064     05,3371  24 334 0            INCR    CTLIST          SET POINTER TO PICK UP NEXT CTLIST WORD
0181                         05,3372  1 3376 1            TCF     +4              ON NEXT ENTRY TO PROG. (A SHOULD NOT =0)
0182  REF   5  LAST 1064     05,3373  56 334 0            XCH     CTLIST          SET CTLIST TO NEGATIVE AND PLACE(CODING)
0183                         05,3374  4 0000 0            COM                     UNCOMPLEMENTED DNADR INTO A.    (FOR LA)
0184  REF   6  LAST 1064     05,3375  56 334 C            XCH     CTLIST                                          (ST IN )
0185  REF 261  LAST 1064     05,3376  24 000 1  +4        INCR    A                                               (CTLIST)
0186  REF   3  LAST 1063     05,3377  54 336 C            TS      DNECADR         SAVE DNADR
0187  REF   1                05,3400  6 3350 1            AD      MINTIME2        TEST FOR TIME2 (NEG. OF ECADR)
0188  REF 262  LAST 1064     05,3401  10 000 C            CCS     A
0189  REF   1                05,3402  1 3406 1            TCF     SETWC +1        DON'T SET WORD ORDER CODE
0190                         05,3403   47777 C  MINB1314 OCT     47777           MINUS BIT 13 AND 14  (CAN'T GET HERE)
0191  REF   2  LAST 1064     05,3404  1 3406 1            TCF     SETWC +1        DON'T SET WORD ORDER CODE
0192  REF   1                05,3405  0 3430 C  SETWD     TC      WOZERO          GO SET WORD ORDER CODE TO ZERO.
0193  REF   4  LAST 1064     05,3406  3 0336 1   +1       CA      DNECADR         RELOAD A WITH THE DNADR.
0194  REF   1                05,3407  6 3403 C   +2       AD      MINB1314        IS THIS A REGULAR DNADR?
0195                         05,3410  0 0006 1            EXTEND
0196  REF   2  LAST 1063     05,3411  6 3476 1            BZMF    FETCH2WD        YES. (A MUST NEVER BE ZERO)
0197  REF   1                05,3412  6 7710 C            AD      MINB12          NO- IS IT A POINTER (DNPTR) OR A
0198                         05,3413  0 0006 1            EXTEND                      CHANNEL(DNCHAN)
0199  REF   1                05,3414  6 3434 1            BZMF    DODNPTR         IT'S A POINTER. (A MUST NEVER BE ZERO)

0200                         05,3415  0 0006 1  DODNCHAN  TC      6               (EXECUTED AS EXTEND) IT S A CHANNEL
0201  REF   5  LAST 1064     05,3416  50 336 1            INDEX   DNECADR
0202                         05,3417  44'000 1            INDEX   0 -4000         (EXECUTED AS READ)
0203  REF 153  LAST 1055     05,3420  54 001 1            TS      L
0204                         05,3421  0 0006 1            TC      6               (EXECUTED AS EXTEND)
0205  REF   6  LAST 1064     05,3422  50 336 1            INDEX   DNECADR
0206                         05,3423  43'777 1            INDEX   0 -4001         (EXECUTED AS READ)
0207  REF   7  LAST 1064     05,3424  54 336 C            TS      DNECADR         SET DNECADR
0208  REF  20  LAST 1063     05,3425  3 7716 C            CA      NEGONE              TO MINUS
0209  REF   8  LAST 1064     05,3426  56 336 1            XCH     DNECADR                 WHILE PRESERVING A.
0210  REF   1                05,3427  1 3524 C            TCF     DNTMEXIT        GO SEND CHANNELS

0211  REF  48  LAST 1063     05,3430  4 4704 1  WOZERO    CS      BIT7
0212                         05,3431  0 0006 1            EXTEND
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0213   REF  13  LAST 1063   05,3432  03 013 0          WAND    CHAN13          SET WORD ORDER CODE TO ZERO
0214   REF 209  LAST 1052   05,3433  0 0002 0          TC      Q               RETURN TO CALLER

0215   REF   9  LAST 1064   05,3434  50 336 1  DOONPTR INDEX   DNECADR         DNECADR CONTAINS ADRES OF SUBLIST
0216                         05,3435  0 0000 1          0       0               CLEAR AND ADD LIST ENTRY INTO A.
0217   REF 263  LAST 1064   05,3436  10 000 0          CCS     A               IS THIS A SNAPSHOT SUBLIST
0218   REF  10  LAST 1065   05,3437  3 0336 1          CA      DNECADR         NO, IT IS A REGULAR SUBLIST.
0219   REF   1              05,3440  1 3510 1          TCF     DOSUBLST        A MUST NOT BE ZERO.

0220   REF  11  LAST 1065   05,3441  56 336 1          XCH     DNECADR         YES, IT IS A SNAPSHOT SUBLIST.
0221   REF   3  LAST 1063   05,3442  54 337 1          TS      SUBLIST         C(DNECADR) INTO SUBLIST
0222   REF 204  LAST 1056   05,3443  3 4714 1          CAF     ZERO                  A    INTO    A
0223   REF   2  LAST   70   05,3444  56 336 1          XCH     TMINDEX         (NOTE.. TMINDEX = DNECADR)


R0224  THE FOLLOWING CODING (FROM SNAPLOOP TO SNAPEND)IS FOR THE PURPOSE OF TAKING A SNAPSHOT OF 12 DP REGISTERS.
R0226  THIS IS DONE BY SAVING 11 DP REGISTERS IN DNTMBUFF AND SENDING THE FIRST DP WORD IMMEDIATELY.
R0228  THE SNAPSHOT PROCESSING IS THE MOST TIME CONSUMING AND THEREFORE THE CODING AND LIST STRUCTURE WERE DESIGNED
R0230  TO MINIMIZE TIME. THE TIME OPTIMIZATION RESULTS IN RULES UNIQUE TO THE SNAPSHOT PORTION OF THE DOWNLIST.
R0232  THESE RULES ARE.....
R0233            1.   ONLY 1ONADR'S CAN APPEAR IN THE SNAPSHOT SUBLIST
R0234            2.   THE 1ONADR'S CANNOT REFER TO THE FIRST LOCATION IN ANY  BANK.

0236   REF  42  LAST 1036   05,3445  54 003 0  SNAPLOOP TS      EBANK           SET EBANK
0237   REF   3  LAST  370   05,3446  7 4373 0          MASK    LOW8            ISOLATE RELATIVE ADDRESS
0238                         05,3447  0 0006 1          EXTEND
0239   REF 264  LAST 1065   05,3450  5 0000 1          INDEX   A
0240                         E3,1401                    EBANK=  1401
0241                         05,3451  3 1402 0          DCA     1401            PICK UP 2 SNAPSHOT WORDS.
0242   REF  24  LAST 1063      0340                    EBANK=  DNTMBUFF
0243   REF   3  LAST 1065   05,3452  50 336 1          INDEX   TMINDEX
0244   REF  25  LAST 1065   05,3453  52 341 0          DXCH    DNTMBUFF        STORE 2 SNAPSHOT WORDS IN BUFFER
0245   REF   4  LAST 1065   05,3454  24 336 1          INCR    TMINDEX         SET BUFFER INDEX FOR NEXT 2 WORDS.
0246   REF   5  LAST 1065   05,3455  24 336 1          INCR    TMINDEX
0247   REF   4  LAST 1065   05,3456  24 337 0  SNAPAGN  INCR    SUBLIST         SET POINTER TO NEXT 2 WORDS OF SNAPSHOT
0248   REF   5  LAST 1065   05,3457  50 337 0          INDEX   SUBLIST
0249                         05,3460  0 0000 1          0       0               = CA SSSS (SSSS = NEXT ENTRY IN SUBLIST)
0250   REF 265  LAST 1065   05,3461  10 000 0          CCS     A               TEST FOR LAST TWO WORDS OF SNAPSHOT.
0251   REF   1              05,3462  1 3445 0          TCF     SNAPLOOP        NOT LAST TWO.
0252   REF   1              05,3463    03346 0 LONPHAS2 GENADR DNPHASE2
0253   REF   6  LAST 1065   05,3464  54 337 1          TS      SUBLIST         YES, LAST.  SAVE A.
0254   REF  21  LAST 1064   05,3465  3 7716 0          CA      NEGONE          SET ONECADR AND
0255   REF  12  LAST 1065   05,3466  54 336 0          TS      DNECADR              SUBLIST POINTERS
0256   REF   7  LAST 1065   05,3467  56 337 0          XCH     SUBLIST                   TO NEGATIVE VALUES.
0257   REF  43  LAST 1065   05,3470  54 003 0          TS      EBANK
0258   REF   4  LAST 1065   05,3471  7 4373 0          MASK    LOW8
0259                         05,3472  0 0006 1          EXTEND
0260   REF 266  LAST 1065   05,3473  5 0000 1          INDEX   A
0261                         E3,1401                    EBANK=  1401
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0262                          05,3474  3 1402 C            DCA     1401          PICK UP FIRST 2 WORDS OF SNAPSHOT.
0263  REF  26  LAST 1065       0340                        EBANK=  DNTMBUFF
0264  REF   2  LAST 1064       05,3475  1 3524 C  SNAPEND  TCF     DNTMEXIT        NOW GO SEND THEM.

0265  REF  13  LAST 1065       05,3476  3 0336 1  FETCH2WO CA      DNECADR
0266  REF  44  LAST 1065       05,3477  54 003 C            TS      EBANK         SET EBANK
0267  REF   5  LAST 1065       05,3500  7 4373 C            MASK    LOW8          ISOLATE RELATIVE ADDRESS
0268  REF 154  LAST 1064       05,3501  54 001 1            TS      L
0269  REF   1                  05,3502  3 3354 C            CA      DNADRDCR      DECREMENT COUNT AND ECADR
0270  REF  14  LAST 1066       05,3503  26 336 C            ADS     DNECADR
0271                          05,3504  0 0006 1            EXTEND
0272  REF 155  LAST 1066       05,3505  5 0001 C            INDEX   L
0273                          E3,1400                     EBANK=  1400
0274                          05,3506  3 1401 C            DCA     1400          PICK UP 2 DATA WORDS
0275  REF  27  LAST 1066       0340                        EBANK=  DNTMBUFF
0276  REF   3  LAST 1066       05,3507  1 3524 C            TCF     DNTMEXIT        NOW GO SEND THEM.

0277  REF   8  LAST 1065       05,3510  54 337 1  DOSUBLST TS      SUBLIST       SET SUBLIST POINTER
0278  REF   9  LAST 1066       05,3511  50 337 C  NEXTINSL INDEX   SUBLIST
0279                          05,3512  0 0000 1            0       0             = CA SSSS (SSSS = NEXT ENTRY IN SUBLIST)
0280  REF 267  LAST 1065       05,3513  10 000 C            CCS     A             IS IT THE END OF THE SUBLIST
0281  REF  10  LAST 1066       05,3514  24 337 C            INCR    SUBLIST       NO-
0282                          05,3515  1 3521 C            TCF     +4
0283  REF  11  LAST 1066       05,3516  54 337 1            TS      SUBLIST       SAVE A.
0284  REF  22  LAST 1065       05,3517  3 7716 C            CA      NEGONE        SET SUBLIST TO MINUS
0285  REF  12  LAST 1066       05,3520  56 337 C            XCH     SUBLIST       RETRIEVE A.
0286  REF 268  LAST 1066       05,3521  24 000 1  +4       INCR    A
0287  REF  15  LAST 1066       05,3522  54 336 C            TS      DNECADR       SAVE DNADR
0288  REF   3  LAST 1064       05,3523  1 3407 C            TCF     SETWC +2      GO USE COMMON CODING(PROBLEMS WOULD
A0289                                                                             OCCUR IF THE PROGRAM ENCOUNTERED A
A0290                                                                             DNPTR NOW)

0291                          05,3524  0 0006 1  DNTMEXIT EXTEND                  DOWN-TELEMETRY EXIT
0292  REF   1                  05,3525  01 034 1            WRITE   DNTM1         TO SEND A + L TO CHANNELS 34 + 35
0293  REF 156  LAST 1066       05,3526  3 0001 C            CA      L             RESPECTIVELY
0294                          05,3527  0 0006 1  TMEXITL  EXTEND
0295  REF   1                  05,3530  01 035 C            WRITE   DNTM2
0296  REF  47  LAST 1058       05,3531  1 5222 1  TMRESUME TCF     RESUME        EXIT TELEMETRY PROGRAM VIA RESUME.

0297  REF   1                      7710                    MIN812  EQUALS -1/8
0298  REF   6  LAST 1065          0336                    DNECADR EQUALS TMINDEX
0299  REF   1                      0334                    CTLIST  EQUALS LDATALST
0300  REF   1                      0337                    SUBLIST EQUALS DNQ
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R0301   SUBROUTINE NAME- DNDUMP
R0302   FUNCTIONAL DESCRIPTION - TO SEND(DUMP) ALL ERASABLE STORAGE 'N' TIMES.(N = 1 TO 4). BANKS ARE SENT ONE AT A TIME
R0304           EACH BANK IS PRECEEDED BY AN ID WORD, SYNCH BITS, ECADR AND TIME1 FOLLOWED BY THE 256D WORDS OF EACH
R0306           EBANK. EBANKS ARE DUMPED IN ORDER(I.E. EBANK 0 FIRST, THEN EBANK1 ETC.)
R0308   CALLING SEQUENCE- THE GROUND OR ASTRONAUT BY KEYING V74E CAN INITIALIZE THE DUMP.
R0310           AFTER KEYING IN V74E THE CURRENT DOWNLIST WILL BE IMMEDIATELY TERMINATED AND THE DOWNLINK ERASABLE DUMP
R0312           WILL BEGIN.
R0313           ONCE INITIATED THE DOWNLINK ERASABLE DUMP CAN BE TERMINATED (AND INTERRUPTED DOWNLIST REINSTATED) ONLY
R0315           BY THE FOLLOWING:
R0316            1. A FRESH START
R0317            2. COMPLETION OF ALL DOWNLINK DUMPS REQUESTED (ACCORDING TO BITS SET IN DUMPCNT). NOTE THAT DUMPCNT
R0319               CAN BE ALTERED BY A V21N01.
R0320            3. AND INVOLUNTARILY BY A RESTART.
R0321   NORMAL EXIT MODE- TCF DNPHASE1
R0322   ALARM OR ABORT MODE- NONE
R0323   *SUBROUTINES CALLED- NONE.
R0324   ERASABLE INITIALIZATION REQUIRED-
R0325           DUMPCNT   OCT  20000   IF 4 COMPLETE ERASABLE DUMPS ARE DESIRED
R0326           DUMPCNT   OCT  10000   IF 2 COMPLETE ERASABLE DUMPS ARE DESIRED
R0327           DUMPCNT   OCT  04000   IF 1 COMPLETE ERASABLE DUMP  IS  DESIRED
R0328   DEBRIS- DUMPLOC, DUMPSW, DNTMGOTO, EBANK AND CENTRAL REGISTERS
R0329   TIMING-   TIME(IN SECS) = ((NO.DUMPS)*(NO.EBANKS)* (WDSPEREBANK + NO.IDWDS)) / NO.WDSPERSEC
R0331           TIME(IN SECS) =  (   4   )*(    8    )* (    256     +     4    ) /      100
R0333       THUS TIME(IN SECS TO SEND DUMP OF ERASABLE 4 TIMES VIA DOWNLINK) = 83.2 SECONDS

R0335   STRUCTURE OF ONE EBANK AS IT IS SENT BY DOWNLINK PROGRAM-
R0336     (REMINDER-THIS ONLY DESCRIBES ONE OF THE 8 EBANKS X 4 (DUMPS) = 32 EBANKS WHICH WILL BE SENT BY DNDUMP)
R0338          DOWNLIST                                          W
R0339           WORD   TAKEN FROM CONTENTS OF    EXAMPLE  0  COMMENTS

R0340             1    ERASID                    0177X    0  DOWNLIST I.D. FOR DOWNLINK ERASABLE DUMP (X=7 CSM, 6 LM)
R0342             2    LOWIDCOD                  77340    1  DOWNLINK SYNCH BITS.(SAME ONE USED IN ALL OTHER DOWNLISTS)
R0344             3    DUMPLOC                   13400    1  (SEE NOTES ON DUMPLOC)1= 3RD ERAS DUMP, 3400=ECADR OF 5TH WD
R0346             4    TIME1                     14120    1  TIME IN CENTISECONDS
R0347             5    FIRST WORD OF EBANK X     03400    1  IN THIS EXAMPLE THIS WORD = CONTENTS OF E7,1400 (ECADR 3400)
R0349             6    2ND   WORD OF EBANK X     00142    1  IN THIS EXAMPLE THIS WORD = CONTENTS OF E7,1401 (ECADR 3401)
R0351             7    3RD   WORD OF EBANK X     00142    1  IN THIS EXAMPLE THIS WORD = CONTENTS OF E7,1402 (ECADR 3402)
R0353             .                              .        1
R0354             .                              .        1
R0355             .                              .        1
R0356           260D   256TH WORD OF EBANK X     03777    1  IN THIS EXAMPLE THIS WORD = CONTENTS OF E7,1777 (ECADR 3777)

R0358   NOTE- DUMPLOC CONTAINS THE COUNTER AND ECADR FOR EACH WORD BEING SENT.
R0359         THE BIT STRUCTURE OF DUMPLOC IS FOLLOWS---
R0360                                        X = NOT USED
R0361           X ABC EEE RRRRRRRR         ABC = ERASABLE DUMP COUNTER(I.E. ABC = 0,1,2 OR 3 WHICH MEANS THAT
R0363                                            COMPLETE ERASABLE DUMP NUMBER  1,2,3 OR 4 RESPECTIVELY IS IN PROGRESS)
R0365                                      EEE = EBANK BITS
R0366                                 RRRRRRRR = RELATIVE ADDRESS WITHIN AN EBANK.
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0368  REF 205  LAST 1065   05,3532  3 4714 1  DNDUMPI  CA    ZERO       INITIALIZE DOWNLINK
0369  REF   1               05,3533  54 336 C           TS    DUMPLOC    ERASABLE DUMP
0370  REF   2  LAST 1064   05,3534  0 3576 C    +2     TC    SENDID     GO SEND ID AND SYNCH BITS
0371  REF   1               05,3535  3 3544 1           CA    LDNDUMPI   SET DNTMGOTO
0372  REF   5  LAST 1063   05,3536  54 335 C           TS    DNTMGOTO   TO LOCATION FOR NEXT PASS
0373  REF  18  LAST 1058   05,3537  3 0025 C           CA    TIME1      PLACE TIME1
0374  REF 157  LAST 1066   05,3540  56 001 C           XCH   L          INTO L
0375  REF   2  LAST 1068   05,3541  3 0336 1           CA    DUMPLOC    AND ECADR OF THIS EBANK INTO A
0376  REF   4  LAST 1066   05,3542  1 3524 C           TCF   DNTMEXIT   SEND DUMPLOC AND TIME1

0377  REF   1               05,3543   03545 C  LDNDUMP  ADRES DNDUMP
0378  REF   1               05,3544   03560 1  LDNDUMPI ADRES DNDUMPI

0379  REF  51  LAST 1054   05,3545  3 4711 1  DNDUMP   CA    TWO        INCREMENT ECADR IN DUMPLOC
0380  REF   3  LAST 1068   05,3546  26 336 C           ADS   DUMPLOC    TO NEXT DP WORD TO BE
0381  REF   6  LAST 1066   05,3547  7 4373 C           MASK  LOW8       DUMPED AND SAVE IT.
0382  REF 269  LAST 1066   05,3550  10 000 C           CCS   A          IS THIS THE BEGINNING OF A NEW EBANK
0383  REF   1               05,3551  1 3562 1           TCF   DNDUMP2    NO- THEN CONTINUE DUMPING
0384  REF   4  LAST 1068   05,3552  3 0336 1           CA    DUMPLOC    YES- IS THIS THE END OF THE
0385  REF   1               05,3553  7 0333 C           MASK  DUMPCNT    N TH(N = 1 TO 4) COMPLETE ERASABLE
0386  REF   7  LAST  983   05,3554  7 7671 1           MASK  PRIO34     DUMP(BIT14 FOR 4, BIT13 FOR 2 OR BIT12
0387  REF 270  LAST 1068   05,3555  10 000 C           CCS   A          FOR 1 COMPLETE ERASABLE DUMP(S)).
0388  REF   2  LAST  187   05,3556  1 3340 1           TCF   DNPHASE1   YES- START SENDING INTERRUPTED DOWNLIST
A0389                                                                  AGAIN
0390  REF   2  LAST  253   05,3557  1 3534 1           TCF   DNDUMPI +2 NO- GO BACK AND INITIALIZE NEXT BANK

0391  REF   1               05,3560  3 3543 C  DNDUMP1  CA    LDNDUMP    SET DNTMGOTO
0392  REF   6  LAST 1068   05,3561  54 335 C           TS    DNTMGOTO   FOR WORDS 3 TO 2560 OF CURRENT EBANK

0393  REF   5  LAST 1068   05,3562  3 0336 1  DNDUMP2  CA    DUMPLOC
0394  REF  45  LAST 1066   05,3563  54 003 C           TS    EBANK      SET EBANK
0395  REF   7  LAST 1068   05,3564  7 4373 C           MASK  LOW8       ISOLATE RELATIVE ADDRESS.
0396  REF 210  LAST 1065   05,3565  54 002 1           TS    Q          (NOTE: MASK INSTRUCTION IS USED TO PICK
0397  REF  14  LAST  692   05,3566  3 4713 C           CA    NEGO       UP ERASABLE REGISTERS SO THAT EDITING
0398  REF 158  LAST 1068   05,3567  54 001 1           TS    L          REGISTERS 20-23 WILL NOT BE ALTERED.)
0399  REF 211  LAST 1068   05,3570  50 002 C           INDEX Q
0400                       E3,1400                    EBANK= 1400      PICK UP LOW ORDER REGISTER OF PAIR
0401                       05,3571  7 1401 1          MASK  1401       OF ERASABLE REGISTERS.
0402  REF 159  LAST 1068   05,3572  56 001 C           XCH   L
0403  REF 212  LAST 1068   05,3573  50 002 C           INDEX Q          PICK UP HIGH ORDER REGISTER OF PAIR
0404                       05,3574  7 1400 C           MASK  1400       OF ERASABLE REGISTERS.
0405  REF  28  LAST 1066      0340                    EBANK= DNTMBUFF
0406  REF   5  LAST 1068   05,3575  1 3524 C           TCF   DNTMEXIT   GO SEND THEM

0407                       05,3576  0 0006 1  SENDID   EXTEND           **ENTRANCE USED BY ERASABLE DUMP PROG.**
0408  REF   7  LAST 1068   05,3577  22 335 1           QXCH  DNTMGOTO   SET DNTMGOTO SO NEXT TIME PROG WILL GO
0409  REF   1               05,3600  3 4747 1           CAF   ERASID     TO LOCATION FOLLOWING :TC SENDID:

0410  REF 160  LAST 1068   05,3601  54 001 1           TS    L          **ENTRANCE USED BY REGULAR DOWNLINK PG**
```

0411	REF	2	LAST 1064	05,3602	0 3430 C	TC	WOZERO	GO SET WORD ORDER CODE TO ZERO
0412	REF	1		05,3603	3 2000 C	CAF	LOWIDCOD	PLACE SPECIAL ID CODE INTO L
0413	REF	161	LAST 1068	05,3604	56 CC1 C	XCH	L	AND ID BACK INTO A
0414	REF	6	LAST 1068	05,3605	1 3524 C	TCF	DNTMEXIT	SEND DOWNLIST ID CODE(S).

L INTER-BANK COMMUNICATION USER'S PAGE NO. 1 EO S3

```
R0001           THE FOLLOWING ROUTINE CAN BE USED TO CALL A SUBROUTINE IN ANOTHER BANK. IN THE BANKCALL VERSION, THE
R0003   CADR OF THE SUBROUTINE IMMEDIATELY FOLLOWS THE  TC BANKCALL  INSTRUCTION, WITH C(A) AND C(L) PRESERVED.

 0005                           4555                    BLOCK   02
 00055  REF   1                                         COUNT   02/BANK

 0006   REF   4  LAST  411     4555  52 134 C  BANKCALL DXCH    BUF2            SAVE INCOMING A,L.
 0007   REF 213  LAST 1068     4556  50 002 C            INDEX   Q               PICK UP CADR.
 0008                          4557  3 0000 1            CA      0
 0009   REF 214  LAST 107C     4560  24 002 C            INCR    Q               SO WE RETURN TO THE LOC. AFTER THE CADR.

R0010           SWCALL IS IDENTICAL TO BANKCALL, EXCEPT THAT THE CADR ARRIVES IN A.

 0012   REF 162  LAST 1069     4561  54 001 1  SWCALL   TS      L
 0013   REF   3  LAST  374     4562  22 004 C            LXCH    FBANK           SWITCH BANKS, SAVING RETURN.
 0014   REF   7  LAST  611     4563  7 4747 C            MASK    LOW10           GET SUB-ADDRESS OF CADR.
 0015   REF 215  LAST 107C     4564  56 002 C            XCH     Q               A,L NOW CONTAINS DP RETURN.
 0016   REF   5  LAST 1070     4565  52 134 C            DXCH    BUF2            RESTORING INPUTS IF THIS IS A BANKCALL.
 0017   REF 216  LAST 107C     4566  50 002 C            INDEX   Q
 0018                          4567  0 2000 C            TC      10000           SETTING Q TO SWRETURN.

 0019   REF   6  LAST 1070     4570  56 134 1  SWRETURN XCH     BUF2 +1         COMES HERE TO RETURN TO CALLER. C(A,L)
 0020   REF   4  LAST 107C     4571  56 004 C            XCH     FBANK           ARE PRESERVED FOR RETURN.
 0021   REF   7  LAST 107C     4572  56 134 1            XCH     BUF2 +1
 0022   REF   8  LAST 107C     4573  0 0133 C            TC      BUF2

R0023           THE FOLLOWING ROUTINE CAN BE USED AS A UNILATERAL JUMP WITH C(A,L) PRESERVED AND THE CADR IMMEDIATELY
R0025   FOLLOWING THE TC POSTJUMP INSTRUCTION.

 0026   REF 217  LAST 107C     4574  56 002 C  POSTJUMP XCH     Q               SAVE INCOMING C(A).
 0027   REF 271  LAST 1068     4575  50 000 1            INDEX   A               GET CADR.
 0028                          4576  3 0000 1            CA      0

R0029           BANKJUMP IS THE SAME AS POSTJUMP, EXCEPT THAT THE CADR ARRIVES IN A.

 0031   REF   5  LAST 1070     4577  54 004 1  BANKJUMP TS      FBANK
 0032   REF   8  LAST 107C     4600  7 4747 C            MASK    LOW10
 0033   REF 218  LAST 107C     4601  56 002 C            XCH     Q               RESTORING INPUT C(A) IF THIS WAS A
 0034   REF 219  LAST 107C     4602  50 002 C  Q+10000   INDEX   Q               POSTJUMP.
 0035                          4603  1 2000 1  PRIO12    TCF     10000           PRIO12 = TCF   10000 = 12000
```

P0036 THE FOLLOWING ROUTINE GETS THE RETURN CADR SAVED BY SWCALL OR BANKCALL AND LEAVES IT IN A.

```
0038   REF   9  LAST 1070    4604  3 4747 1  MAKECADR CAF    LOW10
0039   REF   9  LAST 1070    4605  7 0133 1           MASK   BUF2
0040   REF  10  LAST 1071    4606  6 0134 1           AD     BUF2 +1
0041   REF 220  LAST 1070    4607  0 0002 0           TC     Q


00465  REF   4  LAST  372    4610  54 135 1  SUPDACAL TS     MPTEMP
0047   REF   6  LAST 1070    4611  56 004 0           XCH    FBANK          SET FBANK FOR DATA.
00475                        4612  0 0006 1           EXTEND
0048   REF  10  LAST  575    4613  04 007 1           ROR    SUPERBNK       SAVE FBANK IN BITS 15-11, AND
00485  REF   5  LAST 1071    4614  56 135 0           XCH    MPTEMP          SUPERBANK IN BITS  7-5.
0049   REF  10  LAST 1071    4615  7 4747 0           MASK   LOW10
00495  REF 163  LAST 1070    4616  56 001 0           XCH    L              SAVE REL. ADR. IN BANK, FETCH SUPERBITS.
0050                         4617  0 0004 0           INHINT                BECAUSE RUPT DOES NOT SAVE SUPERBANK.
00505                        4620  0 0006 1           EXTEND
0051   REF  11  LAST 1071    4621  01 007 1           WRITE  SUPERBNK       SET SUPERBANK FOR DATA.
0052   REF 164  LAST 1071    4622  50 001 0           INDEX  L
00525                        4623  3 2000 0           CA     10000          PINBALL (FIX MEM DISP) PREVENTS DCA HERE
0053   REF   6  LAST 1071    4624  56 135 0           XCH    MPTEMP         SAVE 1ST WD, FETCH OLD FBANK AND SBANK.
00534                        4625  0 0006 1           EXTEND
00535  REF  12  LAST 1071    4626  01 007 1           WRITE  SUPERBNK       RESTORE SUPERBANK.
0054                         4627  0 0003 1           RELINT
00545  REF   7  LAST 1071    4630  54 004 1           TS     FBANK          RESTORE FBANK.
0055   REF   7  LAST 1071    4631  3 0135 0           CA     MPTEMP         RECOVER FIRST WORD OF DATA.
00555                        4632  0 0002 0           RETURN                24 WDS. DATACALL 516 MU, SUPDACAL 432 MU
```

L INTER-BANK COMMUNICATION USER'S PAGE NO. 3 EO S3

P0056 THE FOLLOWING ROUTINES ARE IDENTICAL TO BANKCALL AND SWCALL EXCEPT THAT THEY ARE USED IN INTERRUPT.

```
0058  REF   2  LAST  413   4633  52 073 1  IBNKCALL DXCH   RUPTREG3      USES RUPTREG3,4 FOR DP RETURN ADDRESS.
0059  REF 221  LAST 1071   4634  50 002 C           INDEX  Q
0060             LAST       4635  3 0000 1           CAF    0
0061  REF 222  LAST 1072   4636  24 002 C           INCR   Q

0062  REF 165  LAST 1071   4637  54 001 1  ISWCALL  TS     L
0063  REF   8  LAST 1071   4640  22 004 C           LXCH   FBANK
0064  REF  11  LAST 1071   4641  7 4747 C           MASK   LOW10
0065  REF 223  LAST 1072   4642  56 002 C           XCH    Q
0066  REF   3  LAST 1072   4643  52 073 1           DXCH   RUPTREG3
0067  REF 224  LAST 1072   4644  50 002 C           INDEX  Q
0068             LAST       4645  0 2000 0           TC     10000

0069  REF   3  LAST   65   4646  56 073 C  ISWRETRN XCH    RUPTREG4
0070  REF   9  LAST 1072   4647  56 004 C           XCH    FBANK
0071  REF   4  LAST 1072   4650  56 073 C           XCH    RUPTREG4
0072  REF   4  LAST 1072   4651  0 0072 1           TC     RUPTREG3
```

R0090 2. USPRCADR ACCESSES INTERPRETIVE CODING IN OTHER THAN THE USER'S FBANK. THE CALLING SEQUENCE IS AS FOLLOWS:

```
A0092                                  L       TC     USPRCADR
A0093                                  L+1     CADR   INTPRETX      INTPRETX IS THE INTERPRETIVE CODING
A0094                                                               RETURN IS TO L+2

0103  REF   5  LAST  413   4652  54 164 C  USPRCADR TS     LOC       SAVE A
0104  REF  25  LAST  915   4653  3 4703 1           CA     BIT8
0105  REF   7  LAST  363   4654  54 023 1           TS     EDOP      EXIT INSTRUCTION TO EDOP
0106  REF  14  LAST  573   4655  3 0006 1           CA     BBANK
0107  REF   1              4656  54 165 1           TS     BANKSET   USER'S BBANK TO BANKSET
0108  REF 225  LAST 1072   4657  50 002 C           INDEX  Q
0109             LAST       4660  3 0000 1           CA     0
0110  REF  10  LAST 1072   4661  54 004 1           TS     FBANK     INTERPRETIVE BANK TO FBANK
0111  REF  12  LAST 1072   4662  7 4747 C           MASK   LOW10     YIELDS INTERPRETIVE RELATIVE ADDRESS
0112  REF 226  LAST 1072   4663  56 002 C           XCH    Q         INTERPRETIVE ADDRESS TO Q, FETCHING L+1
0113  REF   6  LAST 1072   4664  56 164 1           XCH    LOC       L+1 TO LOC, RETRIEVING ORIGINAL A
0114  REF   1              4665  1 4602 C           TCF    Q+10000
```

```
P0117   THERE ARE FOUR POSSIBLE SETTINGS FOR CHANNEL 07. (CHANNEL 07 CONTAINS THE SUPERBANK SETTING.)
R0119                                                PSEUDO-FIXED     OCTAL PSEUDO
R0120   SUPERBANK      SETTING     S-REG. VALUE      BANK NUMBERS     ADDRESSES
R0121   ----------      -------     ------------      ------------     ------------

R0122   SUPERBANK 3      0XX       2000 - 3777         30 - 37        70000 - 107777   (WHERE XX CAN BE ANYTHING AND
R0124                                                                                  WILL USUALLY BE SEEN AS 11)
R0126   SUPERBANK 4      100       2000 - 3777         40 - 47        110000 - 127777  (AS FAR AS IT CAN BE SEEN,
R0128                                                                                  ONLY BANKS 40-43 WILL EVER BE
R0130                                                                                  AND ARE PRESENTLY AVAILABLE)
R0132   SUPERBANK 5      101       2000 - 3777         50 - 57        130000 - 147777  (PRESENTLY NOT AVAILABLE TO
R0134                                                                                  THE USER)
R0136   SUPERBANK 6      110       2000 - 3777         60 - 67        150000 - 167777  (PRESENTLY NOT AVAILABLE TO
R0138                                                                                  THE USER)
R0142   *** THIS ROUTINE MAYBE CALLED BY ANY PROGRAM LOCATED IN BANKS 00 - 27.  I.E., NO PROGRAM LIVING IN ANY
R0144   SUPERBANK SHOULD USE SUPERSW.  ***

R0145   SUPERSW MAYBE CALLED IN THIS FASHION:

R0146           CAF     ABBCON          WHERE -- ABBCON  BBCON  SOMETHIN --
R0147           TCR     SUPERSW         (THE SUPERBNK BITS ARE IN THE BBCON)
R0148           ...       ...
R0149           .         .
R0150           .         .

R0151   OR IN THIS FASHION :

R0152           CAF     SUPERSET        WHERE SUPERSET IS ONE OF THE FOUR AVAILABLE
R0154           TCR     SUPERSW         SUPERBANK BIT CONSTANTS:
R0155           ...       ...                                    SUPER011 OCTAL  60
R0157           .         .                                      SUPER100 OCTAL 100
R0159           .         .                                      SUPER101 OCTAL 120
R0161                                                            SUPER110 OCTAL 140

 0163                                4666  0 0006 1  SUPERSW  EXTEND
 0164   REF  13  LAST 1071          4667  01 007 1            WRITE  SUPERBNK     WRITE BITS 7-6-5 OF THE ACCUMULATOR INTO
A0165                                                                            CHANNEL 07
 0166   REF 227  LAST 1072          4670  0 0002 0            TC     Q            TC TO INSTRUCTION FOLLOWING
A0167                                                                              TC  SUPERSW
```

R0001 SECTION 1 DISPATCHER

R0002 ENTRY TO THE INTERPRETER. INTPRET SETS LOC TO THE FIRST INSTRUCTION, BANKSET TO THE BBANK OF THE
R0004 OBJECT INTERPRETIVE PROGRAM, AND INTBIT15 TO THE BIT15 CONTENTS OF FBANK. INTERPRETIVE PROGRAMS MAY BE IN
R0006 VIRTUALLY ALL BANKS PRESENT UNDER ANY SUPER-BANK SETTING, WITH THE RESTRICTION THAT PROGRAMS IN HIGH BANKS
R0008 (BIT15 OF FBANK = 1) DO NOT REFER TO LOWBANKS, AND VICE-VERSA. THE INTERPRETER DOES NOT SWITCH SUPERBANKS.
R0010 E-BANK SWITCHING OCCURS WHENEVER GENERAL ERASABLE (100 - 3777) IS ADDRESSED.

```
0012                                6006                    BLOCK  03

0013  REF   1                                               COUNT  03/INTER

00135                               6006  0 0003 1  INTPRET  RELINT
0014                                6007  0 0006 1           EXTEND                 SET LOC TO THE WORD FOLLOWING THE TC.
0015  REF   7  LAST 1072           6010  22 164 1           QXCH   LOC

0016  REF  15  LAST 1072           6011  3 0006 1   +2      CA     BBANK           INTERPRETIVE BRANCHES FINISH HERE.
0017  REF   2  LAST 1072           6012  54 165 1           TS     BANKSET
0018  REF  43  LAST  984           6013  7 4674 1           MASK   BIT15           GET 15TH BIT FOR INDEXABLE ADDRESSES.
0019  REF   5  LAST   66           6014  54 115 0           TS     INTBIT15

0020  REF   8  LAST 1072           6015  54 023 1           TS     EDOP            MAKE SURE NO INSTRUCTIONS LEFT OVER
0021  REF   1                     6016  1 6037 1           TCF    NEWOPS          PICK UP OP CODE PAIR AND BEGIN.


0022  REF  16  LAST 1074           6017  22 006 1  INTRSM   LXCH   BBANK           RESUME SUSPENDED INTERPRETIVE JOB
0023  REF 227  LAST  888           6020  1 6011 0           TCF    INTPRET +3
R0024                 DLOAD LOADS MPAC, MPAC +1, LEAVING ZERO IN MPAC +2.

0025                                6021  0 0006 1  DLOAD    EXTEND
0026  REF   1                     6022  5 0116 1           INDEX  ADDRWD
0027                                6023  3 0001 0           DCA    0               LOAD DP C(C(ADDRWD)) INTO MPAC,MPAX +1
0028  REF 290  LAST  888           6024  52 155 1  SLOAD2   DXCH   MPAC
0029  REF 206  LAST 1068           6025  3 4714 1           CAF    ZERO            ZERO MPAC +2
```

```
P0030           AT THE END OF MOST INSTRUCTIONS, CONTROL IS GIVEN TO DANZIG TO DISPATCH THE NEXT OPERATION.

 0032   REF 291  LAST 1074    6026  54 156 1          TS      MPAC +2         AND DECLARE DP MODE

 0033   REF   4  LAST  531    6027  54 163 1 NEWMODE  TS      MODE            PROLOGUE FOR MODE-CHANGING INSTRUCTIONS.

 0034   REF   3  LAST 1074    6030  3 0165 C DANZIG    CA      BANKSET         SET BBANK BEFORE TESTING NEWJOB SO THAT
 0035   REF  17  LAST 1074    6031  54 006 C           TS      BBANK           IT MAY BE SAVED DIRECTLY BY CHANJOB.

 0036   REF   9  LAST 1074    6032  10 023 1 NOIBNKSW  CCS     EDOP            SEE IF AN ORDER CODE IS LEFT OVER FROM
 0037   REF   1               6033  1 6046 1           TCF     OPJUMP          THE LAST PAIR RETRIEVED. IF SO, EXECUTE.
A0038                                                                         EDOP IS SET TO ZERO ON ITS RE-EDITING.

 0039   REF   5  LAST  825    6034  10 067 1           CCS     NEWJOB          SEE IF A JOB OF HIGHER PRIORITY IS
 0040   REF   1               6035  1 5063 C           TCF     CHANG2          PRESENT, AND IF SO, CHANGE JOBS.

 0041   REF   8  LAST 1074    6036  24 164 1           INCR    LOC             ADVANCE THE LOCATION COUNTER.
R0042           ITRACE (1) REFERS TO "NEWOPS".
 0043   REF   9  LAST 1075    6037  50 164 1 NEWOPS    INDEX   LOC             ENTRY TO BEGIN BY PICKING OP CODE PAIR.
 0044                         6040  3 0000 1           CA      0               MAY BE AN OPCODE PAIR OR A STORE CODE.
 0045   REF 272  LAST 1076    6041  10 000 C           CCS     A               TEST SIGN AND GET DABS(A).
 0046   REF   1               6042  1 6331 1           TCF     DOSTORE         PROCESS STORE CODE.

 0047                         6043   00177 C LOW7      OCT     177

 0048   REF  10  LAST 1075    6044  54 023 1           TS      EDOP            OP CODE PAIR. LEAVE THE OTHER IN EDOP
 0049   REF   6  LAST  363    6045  7 6043 1           MASK    LOW7            WHERE  CCS EDOP  WILL HONOR IT NEXT.

 0050   REF  13  LAST  376    6046  54 020 1 OPJUMP    TS      CYR             LOWWO ENTERS HERE IF A RIGHT-HAND OP
 0051   REF  14  LAST 1075    6047  10 020 1           CCS     CYR             CODE IS TO BE PROCESSED. TEST PREFICES.
 0052   REF   1               6050  1 6216 C           TCF     OPJUMP2         TEST SECOND PREFIX BIT.

 0053   REF   1               6051  1 6712 1           TCF     EXIT            +0 OP CODE IS EXIT.
```

P0054 PROCESS ADDRESSES WHICH MAY BE DIRECT, INDEXED, OR REFERENCE THE PUSHDOWN LIST.

```
0056   REF  74  LAST 1035    6052  7 4712 C  ADDRESS  MASK    BIT1     SEE IF ADDRESS IS INDEXED. CYR CONTAINED
0057   REF 273  LAST 1075    6053  10 000 C           CCS     A        400XX, SO BIT 1 IS NOW AS IT WAS IN CYR.
0058   REF   1               6054  1 6115 C           TCF     INDEX    FORM INDEXED ADDRESS.

0059   REF  10  LAST 1075    6055  5C 164 1  DIRADRES INDEX   LOC      LOOK AHEAD TO NEXT WORD TO SEE IF
0060                         6056  4 0001 1  OCT40001 CS      1        ADDRESS IS GIVEN.
0061   REF 274  LAST 1076    6057  10 000 C           CCS     A
0062   REF   1               6060  1 6164 C           TCF     PUSHUP   IF NOT.

0063                         6061   77773 1  NEG4     DEC     -4

0064   REF  11  LAST 1076    6062  24 164 1           INCR    LOC      IF SC, TO SHOW WE PICKED UP A WORD.
0065   REF   2  LAST 1074    6063  54 116 C           TS      ADDRWD
```

```
P0066           FINAL DIGESTION OF DIRECT ADDRESSES OF OP CODES WITH 01 PREFIX IS DONE HERE. IN EACH CASE, THE
R0068   REQUIRED 12-BIT SUB-ADDRESS IS LEFT IN ADDRWD, WITH ANY REQUIRED E OR F BANK SWITCHING DONE. ADDRESSES LESS
R0070   THAN 450 ARE TAKEN TO BE RELATIVE TO THE WORK AREA. THE OP CODE IS NOW IN BITS 1-5 OF CYR WITH BIT 14 = 1.


0072   REF   1                  6064  6 6220 1          AD      -ENDVAC     SEE IF ADDRESS RELATIVE TO WORK AREA.
0073   REF 215  LAST 1076       6065  10 000 0          CCS     A
0074   REF   1                  6066  6 7712 1          AD      -ENDERAS    IF NOT, SEE IF IN GENERAL ERASABLE.
0075   REF   1                  6067  1 6074 0          TCF     IERASTST

0076   REF  18  LAST  837       6070  3 0120 1  NETZERO CA      FIXLOC      IF SO, LEAVE THE MODIFIED ADDRESS IN
0077   REF   3  LAST 1076       6071  26 116 0          ADS     ADDRWD      ADDRWD AND DISPATCH.
0078   REF  15  LAST 1075       6072  50 020 0  ITR15   INDEX   CYR         THIS INDEX MAKES THE NEXT INSTRUCTION
0079   REF   1                  6073  7 6242 1          7       INDJUMP -1  TCF INDJUMP + OP, EDITING CYR.

0080                            6074  0 0006 1  IERASTST EXTEND
0081   REF   1                  6075  6 6105 0          BZMF    GEADDR      GO PROCESS GENERAL-ERASABLE ADDRESS.

0082   REF  13  LAST 1072       6076  7 4747 0          MASK    LOW10       FIXED BANK ADDRESS. RESTORE AND ADD 815.
0083   REF  14  LAST 1077       6077  6 4747 1          AD      LOW10       SWITCH BANKS AND LEAVE SUBADDRESS IN
0084   REF   4  LAST 1077       6100  56 116 1          XCH     ADDRWD      ADDRWD FOR OPERAND RETRIEVAL. (THIS
0085   REF   6  LAST 1074       6101  6 0115 1          AD      INTBIT15    METHOD PRECLUDES USE OF THE LAST
0086   REF  11  LAST 1072       6102  54 004 1          TS      FBANK       LOCATION IN EACH FBANK.)
0087   REF  16  LAST 1077       6103  50 020 0  ITR12   INDEX   CYR
0088   REF   2  LAST 1077       6104  7 6242 1          7       INDJUMP -1

0089   REF   8  LAST 1068       6105  7 4373 0  GEADDR  MASK    LOW8
0090   REF   3  LAST  370       6106  6 4744 1          AD      OCT1400
0091   REF   5  LAST 1077       6107  56 116 1          XCH     ADDRWD
0092   REF  46  LAST 1068       6110  54 003 0          TS      EBANK
0093   REF  17  LAST 1077       6111  50 020 0  ITR10   INDEX   CYR
0094   REF   3  LAST 1077       6112  7 6242 1          7       INDJUMP -1
```

P0095 THE FOLLOWING ROUTINE PROCESSES INTERPRETIVE INDEXED ADDRESSES. AN INTERPRETER INDEX REGISTER MAY
R0097 CONTAIN THE ADDRESS OF ANY ERASABLE REGISTER (0-42 BEING RELATIVE TO THE VAC AREA) OR ANY INTERPRETIVE PROGRAM
R0099 BANK, OR ANY INTEGER IN THAT RANGE.

```
0100  REF   1                 6113  3 7702 0  DODLOAD* CAF    DLOAD*      STODL* COMES HERE TO PROCESS LOAD ADR.
0101  REF  18  LAST 1077      6114  54 020 1           TS     CYR         (STOVL* ENTERS HERE).

0102  REF  19  LAST 1077      6115  3 0120 1  INDEX    CA     FIXLOC      SET UP INDEX LOCATION.
0103  REF   1                 6116  54 130 1           TS     INDEXLOC
0104  REF  12  LAST 1076      6117  24 164 1           INCR   LOC         (ADDRESS ALWAYS GIVEN).
0105  REF  13  LAST 1078      6120  50 164 1           INDEX  LOC
0106                          6121  4 0000 0           CS     0
0107  REF 276  LAST 1077      6122  10 000 0           CCS    A           INDEX 2 IF ADDRESS STORED COMPLEMENTED.
0108  REF   2  LAST 1078      6123  24 130 0           INCR   INDEXLOC
0109                          6124  16 125 0           NOOP

0110  REF   6  LAST 1077      6125  54 116 0           TS     ADDRWD      14 BIT ADDRESS TO ADDRWD.
0111  REF   2  LAST  128      6126  7 7711 0           MASK   HIGH4       IF ADDRESS GREATER THAN 2K, ADD INTBIT15
0112                          6127  0 0006 1           EXTEND
0113  REF   1                 6130  1 6133 1           BZF    INDEX2
0114  REF   7  LAST 1077      6131  3 0115 1           CA     INTBIT15
0115  REF   7  LAST 1078      6132  26 116 0           ADS    ADDRWD

0116  REF   3  LAST 1078      6133  50 130 0  INDEX2   INDEX  INDEXLOC
0117  REF  48  LAST  879      6134  4 0046 1           CS     X1
0118  REF   8  LAST 1078      6135  26 116 0           ADS    ADDRWD      DO AUGMENT, IGNORING AND CORRECTING OVF.

0119  REF   5  LAST  734      6136  7 7713 1           MASK   HIGH9       SEE IF ADDRESS IS IN WORK AREA.
0120                          6137  0 0006 1           EXTEND
0121  REF   1                 6140  1 6153 1           BZF    INDWORK
0122  REF   3  LAST 1078      6141  7 7711 0           MASK   HIGH4       SEE IF IN FIXED BANK.
0123                          6142  0 0006 1           EXTEND
0124  REF   1                 6143  1 6155 1           BZF    INDERASE

0125  REF   9  LAST 1078      6144  3 0116 1           CA     ADDRWD      IN FIXED - SWITCH BANKS AND CREATE
0126  REF  12  LAST 1077      6145  54 004 1           TS     FBANK       SUB-ADDRESS.
0127  REF  15  LAST 1077      6146  7 4747 0           MASK   LOW10
0128  REF   1                 6147  6 4700 1           AD     2K
0129  REF  10  LAST 1078      6150  54 116 0           TS     ADDRWD
0130  REF  19  LAST 1078      6151  50 020 0  ITR11    INDEX  CYR
0131  REF   4  LAST 1077      6152  3 6242 0           3      INDJUMP -1

0132  REF  20  LAST 1078      6153  3 0120 1  INDWORK  CA     FIXLOC      MAKE ADDRWD RELATIVE TO WORK AREA.
0133  REF   1                 6154  1 6161 0           TCF    ITR13 -1

0134  REF   4  LAST 1077      6155  3 4744 1  INDERASE CA     OCT1400
0135  REF  11  LAST 1078      6156  56 116 1           XCH    ADDRWD
0136  REF  47  LAST 1077      6157  54 003 0           TS     EBANK
0137  REF   9  LAST 1077      6160  7 4373 0           MASK   LOW8
0138  REF  12  LAST 1078      6161  26 116 0  -1       ADS    ADDRWD
```

```
0139   REF  20  LAST 1078      6162  50 020 C  ITR13    INDEX  CYR
0140   REF   5  LAST 1078      6163  3 6242 C           3      INDJUMP -1
```

```
R0141           PUSH-UP ROUTINES. WHEN NO OPERAND ADDRESS IS GIVEN, THE APPROPRIATE OPERAND IS TAKEN FROM THE PUSH-DOWN
R0143   LIST. IN MOST CASES THE MODE OF THE RESULT (VECTOR OR SCALAR) OF THE LAST ARITHMETIC OPERATION PERFORMED
R0145   IS THE SAME AS THE TYPE OF OPERAND DESIRED (ALL ADD/SUBTRACT ETC.). EXCEPTIONS TO THIS GENERAL RULE ARE LISTED
R0147   BELOW (NOTE THAT IN EVERY CASE THE MODE REGISTER IS LEFT INTACT):

R0148           1. VXSC AND V/SC WANT THE OPPOSITE TYPE OF OPERAND, E.G., IF THE LAST OPERATION YIELDED A VECTOR
R0150   RESULT, VXSC WANTS A SCALAR.

R0151           2. THE LOAD CODES SHOULD LOAD THE ACCUMULATOR INDEPENDENT OF THE RESULT OF THE LAST OPERATION. THIS
R0153   INCLUDES VLOAD, DLOAD, TLOAD, PDDL, AND PDVL (NO PUSHUP WITH SLOAD).

R0154           3. SOME ARITHMETIC OPERATIONS REQUIRE A STANDARD TYPE OF OPERAND REGARDLESS OF THE PREVIOUS OPERATION.
R0156   THIS INCLUDES SIGN WANTING DP AND TAD REQUIRING TP.

 0157   REF   1                 6164  3 4374 C  PUSHUP   CAF     OCT23          IF THE LOW 5 BITS OF CYR ARE LESS THAN
 0158   REF  21  LAST 1079      6165  7 0020 1            MASK    CYR            20, THIS OP REQUIRES SPECIAL ATTENTION.
 0159   REF   1                 6166  6 6171 C            AD      -OCT10         (NO -0).
 0160   REF 277  LAST 1078      6167  10 000 C            CCS     A
 0161   REF   1                 6170  1 6202 C            TCF     REGUP          FOR ALL CODES GREATER THAN OCT 7.

 0162                           6171   77767 1  -OCT10    OCT     -10

 0163   REF   2  LAST 1017      6172  6 6061 C            AD      NEG4           WE NOW HAVE 7 - OP CODE(MOD4). SEE IF
 0164   REF 278  LAST 1080      6173  10 000 C            CCS     A              THE OP CODE (MOD4) IS THREE (REVERSE).
 0165   REF 279  LAST 1080      6174  50 000 1            INDEX   A              NO - THE MODE IS DEFINITE. PICK UP THE
 0166   REF   1                 6175  4 6213 C            CS      NO.WDS
 0167   REF   2  LAST 1080      6176  1 6204 C            TCF     REGUP +2

 0168   REF   5  LAST 1079      6177  50 163 C            INDEX   MODE           FOR VXSC AND V/SC WE WANT THE REQUIRED
 0169   REF   1                 6200  4 6211 1            CS      REVCNT         PUSHLOC DECREMENT WITHOUT CHANGING THE
 0170   REF   3  LAST 1080      6201  1 6204 C            TCF     REGUP +2       MODE AT THIS TIME.

 0171   REF   6  LAST 1080      6202  50 163 C  REGUP     INDEX   MODE           MOST ALL OP CODES PUSHUP HERE.
 0172   REF   2  LAST 1080      6203  4 6213 C            CS      NO.WDS
 0173   REF   1                 6204  26 166 1   +2       ADS     PUSHLOC
 0174   REF  13  LAST 1078      6205  54 116 C            TS      ADDRWD
 0175   REF  22  LAST 1080      6206  50 020 C  ITR14     INDEX   CYR
 0176   REF   6  LAST 1079      6207  7 6242 1            7       INDJUMP -1     (THE INDEX MAKES THIS A TCF.)

 0177                           6210   00002 C            OCT     2              REVERSE PUSHUP DECREMENT. VECTOR TAKES 2
 0178                           6211   00006 1  REVCNT    OCT     6              WORDS, SCALAR TAKES 6.
 0179                           6212   00006 1            OCT     6
 0180                           6213   00002 C  NO.WDS    OCT     2              CONVENTIONAL DECREMENT IS 6 WORDS VECTOR
 0181                           6214   00003 1  OCTAL3    OCT     3              2 IN DP, AND 3 IN TP.
 0182                           6215   00006 1            OCT     6
```

```
P0183            TEST THE SECOND PREFIX BIT TO SEE IF THIS IS A MISCELLANEOUS OR A UNARY/SHORT SHIFT OPERATION.

 0185  REF  23  LAST 1080    6216  10 020 1  OPJUMP2  CCS    CYR        TEST SECOND PREFIX BIT.
 0186  REF   1               6217  1 6232 C           TCF    OPJUMP3    TEST THIRD BIT TO SEE IF UNARY OR SHIFT.

 0187                        6220   77722 0  -ENDVAC  DEC    -45

R0188            THE FOLLOWING ROUTINE PROCESSES ADDRESSES OF SUFFIX CLASS 10. THEY ARE BASICALLY WORK AREA ADDRESSES
R0190  IN THE RANGE 0 - 52, ERASABLE FCADR CONSTANTS FROM 100 - 3777, AND FCADRS ABOVE THAT. ALL 15 BITS ARE AVAILABLE
R0192  IN CONTRAST TO SUFFIX 1, IN WHICH ONLY THE LOW ORDER 14 ARE AVAILABLE.

 0193  REF  14  LAST 1078    6221  24 164 1  15BITADR INCR   LOC        (ENTRY HERE FROM STCALL).
 0194  REF  15  LAST 1081    6222  50 164 1           INDEX  LOC        PICK UP ADDRESS WORD.
 0195                        6223  3 0000 1           CA     0
 0196  REF   5  LAST   66    6224  54 117 1           TS     POLISH     WE MAY NEED A SUBADDRESS LATER.

 0197  REF   1               6225  3 4750 1           CAF    LOW7+2K    THESE INSTRUCTIONS ARE IN BANK 1.
 0198  REF  13  LAST 1078    6226  54 004 1           TS     FBANK
 0199  REF  24  LAST 1081    6227  7 0020 1           MASK   CYR
 0200  REF 280  LAST 1080    6230  50 000 1  ITR7     INDEX  A
 0201  REF   1               6231  1 6303 C           TCF    MISCJUMP
```

```
P0202           COMPLETE THE DISPATCHING OF UNARY AND SHORT SHIFT OPERATIONS.

 0203  REF  14  LAST 1081     6232  54 004 1  OPJUMP3  TS      FBANK     CALL IN BANK 0 (BITS 11-15 OF A ARE 0.)
R0204           ITRACE (6) REFERS TO "OPJUMP3".
 0205  REF  25  LAST 1081     6233  10 020 1           CCS     CYR       TEST THIRD PREFIX BIT.
 0206  REF 201  LAST 1081     6234  50 000 1           INDEX   A         THE DECREMENTED UNARY CODE IS IN BITS
 0207  REF   1                6235  1 2000 1           TCF     UNAJUMP   1-4 OF A (ZERO, EXIT, HAS BEEN DETECTED)

 0208  REF   7  LAST 1080     6236  10 163 1           CCS     MODE      ITS A SHORT SHIFT CODE. SEE IF PRESENT
 0209  REF   1                6237  1 2017 1           TCF     SHORTT    SCALAR OR VECTOR.
 0210  REF   2  LAST 1082     6240  1 2017 1           TCF     SHORTT
 0211  REF   1                6241  1 2121 C           TCF     SHORTV    CALLS THE APPROPRIATE ROUTINE.


 0212  REF   1                4364              FBANKMSK EQUALS BANKMASK
 0213  REF  22  LAST  297     6242   00122 C    LVBUF    ADRES   VBUF
```

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P0214 THE FOLLOWING IS THE JUMP TABLE FOR CP CODES WHICH MAY HAVE INDEXABLE ADDRESSES OR MAY PUSH UP.

```
0216  REF  1                6243  1 6454 C  INDJUMP  TCF   VLOAD   00 - LOAD MPAC WITH A VECTOR.
0217  REF  1                6244  1 7040 C            TCF   TAD     01 - TRIPLE PRECISION ADD TO MPAC.
0218  REF  1                6245  1 7624 1            TCF   SIGN    02 - COMPLEMENT MPAC (V OR SC) IF X NEG.
0219  REF  1                6246  1 7350 1            TCF   VXSC    03 - VECTOR TIMES SCALAR.
0220  REF  1                6247  1 6652 1            TCF   CGOTO   04 - COMPUTED GO TO.
0221  REF  2  LAST  396     6250  1 6437 C            TCF   TLOAD   05 - LOAD MPAC WITH TRIPLE PRECISION.
0222  REF  1                6251  1 6021 C            TCF   DLOAD   06 - LOAD MPAC WITH A DP SCALAR.
0223  REF  1                6252  1 7573 C            TCF   V/SC    07 - VECTOR DIVIDED BY SCALAR.

0224  REF  1                6253  1 6450 1            TCF   SLOAD   10 - LOAD MPAC IN SINGLE PRECISION.
0225  REF  1                6254  1 6567 1            TCF   SSP     11 - SET SINGLE PRECISION INTO X.
0226  REF  1                6255  1 6472 1            TCF   PDDL    12 - PUSH DOWN MPAC AND RE-LOAD IN DP.
0227  REF  1                6256  1 7303 1            TCF   MXV     13 - MATRIX POST-MULTIPLIED BY VECTOR.
0228  REF  1                6257  1 6526 1            TCF   PDVL    14 - PUSH DOWN AND VECTOR LOAD.
0229  REF  1                6260  1 6575 1            TCF   CCALL   15 - COMPUTED CALL.
0230  REF  1                6261  1 7306 1            TCF   VXM     16 - MATRIX PRE-MULTIPLIED BY VECTOR.
0231  REF  1                6262  1 7565 1            TCF   TSLC    17 - NORMALIZE MPAC (SCALAR ONLY).

0232  REF  1                6263  1 7543 C            TCF   DMPR    20 - DP MULTIPLY AND ROUND.
0233  REF  1                6264  1 7546 C            TCF   DDV     21 - DP DIVIDE BY.
0234  REF  1                6265  1 7552 C            TCF   BDDV    22 - DP DIVIDE INTO.
0235  REF  1                6266  1 7570 C            TCF   GSHIFT  23 - GENERAL SHIFT INSTRUCTION.
0236  REF  1                6267  1 6720 C            TCF   VAD     24 - VECTOR ADD.
0237  REF  1                6270  1 6716 C            TCF   VSU     25 - VECTOR SUBTRACT.
0238  REF  1                6271  1 7005 1            TCF   BVSU    26 - VECTOR SUBTRACT FROM.
0239  REF  1                6272  1 7300 1            TCF   DOT     27 - VECTOR DOT PRODUCT.

0240  REF  1                6273  1 7427 C            TCF   VXV     30 - VECTOR CROSS PRODUCT.
0241  REF  1                6274  1 7374 1            TCF   VPROJ   31 - VECTOR PROJECTION.
0242  REF  1                6275  1 6754 C            TCF   DSU     32 - DP SUBTRACT.
0243  REF  1                6276  1 7031 C            TCF   BDSU    33 - DP SUBTRACT FROM.
0244  REF  1                6277  1 6744 1            TCF   DAD     34 - DP ADD.
0245                        6300  1 6300 C            TCF           35 - AVAILABLE
0246  REF  1                6301  1 7541 1            TCF   DMP1    36 - DP MULTIPLY.
0247  REF  1                6302  1 7562 C            TCF   SETPD   37 - SET PUSH DOWN POINTER (DIRECT ONLY)
```

R0248 CODES 10 AND 14 MUST NOT PUSH UP. CODE 04 MAY BE USED FOR VECTOR DECLARE BEFORE PUSHUP IF DESIRED.

P0250 THE FOLLOWING JUMP TABLE APPLIES TO INDEX, BRANCH, AND MISCELLANEOUS INSTRUCTIONS.

```
0252  REF  1          6303  1 2371 1  MISCJUMP TCF    AXT          00 - ADDRESS TO INDEX TRUE.
0253  REF  1          6304  1 2376 0           TCF    AXC          01 - ADDRESS TO INDEX COMPLEMENTED.
0254  REF  1          6305  1 2401 1           TCF    LXA          02 - LOAD INDEX FROM ERASABLE.
0255  REF  1          6306  1 2405 0           TCF    LXC          03 - LOAD INDEX FROM COMPLEMENT OF ERAS.
0256  REF  1          6307  1 2411 0           TCF    SXA          04 - STORE INDEX IN ERASABLE.
0257  REF  1          6310  1 2417 0           TCF    XCHX         05 - EXCHANGE INDEX WITH ERASABLE.
0258  REF  1          6311  1 2433 0           TCF    INCR         06 - INCREMENT INDEX REGISTER.
0259  REF  1          6312  1 2442 0           TCF    TIX          07 - TRANSFER ON INDEX.

0260  REF  1          6313  1 2425 1           TCF    XAD          10 - INDEX REGISTER ADD FROM ERASABLE.
0261  REF  1          6314  1 2436 0           TCF    XSU          11 - INDEX SUBTRACT FROM ERASABLE.
0262  REF  1          6315  1 2514 1           TCF    BZE/GOTO     12 - BRANCH ZERO AND GOTO.
0263  REF  1          6316  1 2521 1           TCF    BPL/BMN      13 - BRANCH PLUS AND BRANCH MINUS.
0264  REF  1          6317  1 2474 0           TCF    RTB/BHIZ     14 - RETURN TO BASIC AND BRANCH HI ZERO.
0265  REF  1          6320  1 2534 0           TCF    CALL/ITA     15 - CALL AND STORE QPRET.
0266  REF  1          6321  1 2543 0           TCF    SW/          16 - SWITCH INSTRUCTIONS AND AVAILABLE.
0267  REF  1          6322  1 2504 0           TCF    BOV(B)       17 - BRANCH ON OVERFLOW TO BASIC OR INT.
```

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P0268 THE FOLLOWING JUMP TABLE APPLIES TO UNARY INSTRUCTIONS.

```
0269   REF   1                                        COUNT  00/INTER

0270                    CO,2000                       BANK   0          00 - EXIT - DETECTED EARLIER.
0271   REF   1          CO,2000   1 3207 C  UNAJUMP   TCF    SQRT       01 - SQUARE ROOT.
0272   REF   1          CO,2001   1 3527 C            TCF    SINE       02 - SIN.
0273   REF   1          CO,2002   1 3516 1            TCF    COSINE     03 - COS.
0274   REF   1          CO,2003   1 3607 1            TCF    ARCSIN     04 - ARC SIN.
0275   REF   1          CO,2004   1 3611 C            TCF    ARCCOS     05 - ARC COS.
0276   REF   1          CO,2005   1 3174 1            TCF    DSQ        06 - DP SQUARE.
0277   REF   1          CO,2006   1 2116 1            TCF    ROUND      07 - ROUND TO DP.

0278   REF   1          CO,2007   1 7637 C            TCF    COMP       10 - COMPLEMENT VECTOR OR SCALAR.
0279   REF   1          CO,2010   1 3232 C            TCF    VDEF       11 - VECTOR DEFINE.
0280   REF   1          CO,2011   1 3023 1            TCF    UNIT       12 - UNIT VECTOR.
0281   REF   1          CO,2012   1 3176 C            TCF    ABVALABS   13 - LENGTH OF VECTOR OR MAG OF SCALAR.
0282   REF   1          CO,2013   1 3245 C            TCF    VSQ        14 - SQUARE OF LENGTH OF VECTOR.
0283   REF   1          CO,2014   1 6323 1            TCF    STADR      15 - PUSH UP ON STORE CODE.
0284   REF   1          CO,2015   1 3274 1            TCF    RVQ        16 - RETURN VIA QPRET.
0285   REF   1          CO,2016   1 3247 1            TCF    PUSH       17 - PUSH MPAC DOWN.
```

```
R0286   SECTION 2  LOAD AND STORE PACKAGE.

R0287           A SET OF EIGHT STORE CODES IS PROVIDED AS THE PRIMARY METHOD OF STORING THE MULTI-PURPOSE
R0289   ACCUMULATOR (MPAC). IF IN THE DANZIG SECTION LOC REFERS TO AN ALGEBRAICALLY POSITIVE WORD, IT IS TAKEN AS A
R0291   STORE CODE WITH A CORRESPONDING ERASABLE ADDRESS. MOST OF THESE CODES ARE TWO ADDRESS, SPECIFYING THAT THE WORD
R0293   FOLLOWING THE STORE CODE IS TO BE USED AS AN ADDRESS FROM WHICH TO RE-LOAD MPAC. FOUR OPTIONS ARE AVAILABLE:

R0295           1. STORE            STORE MPAC. THE E ADDRESS MAY BE INDEXED.
R0297           2. STODL            STORE MPAC AND RE-LOAD IT IN DP WITH THE NEXT ADDRESS (THE LOAD MAY BE INDEXED).
R0299           3. STOVL            STORE MPAC AND RE-LOAD A VECTOR (AS ABOVE).
R0301           4. STCALL           STORE AND DO A CALL (BOTH ADDRESSES MUST BE DIRECT HERE).

R0303           STODL AND STOVL WILL TAKE FROM THE PUSH-DOWN LIST IF NO LOAD ADDRESS IS GIVEN.


0305                            6323                    BLOCK  3

0306   REF   2 LAST 1074 TO 1085:   205   205*         COUNT  03/INTER

0307   REF   4  LAST 1075     6323  3 0165 C  STADR     CA     BANKSET      THE STADR CODE (PUSHUP UP ON STORE
0308   REF  15  LAST 1082     6324  54 004 1            TS     FBANK        ADDRESS) ENTERS HERE.
0309   REF  16  LAST 1081     6325  24 164 1            INCR   LOC
0310   REF  17  LAST 1086     6326  50 164 1  ITR1      INDEX  LOC          THE STORECODE WAS STORED COMPLEMENTED TO
0311                           6327  4 0000 0            CS     0            MAKE IT LOOK LIKE AN OPCODE PAIR.
0312   REF  23  LAST 1066     6330  6 7716 C            AD     NEGONE       (YUL CANT REMOVE 1 BECAUSE OF EARLY CCS)

0313   REF  14  LAST 1080     6331  54 116 C  DOSTORE    TS     ADDRWD
0314   REF   7  LAST  371     6332  7 4372 1            MASK   LOW11        ENTRY FROM DISPATCHER. SAVE THE ERASABLE
0315   REF  15  LAST 1086     6333  56 116 1            XCH    ADDRWD       ADDRESS AND JUMP ON THE STORE CODE NO.
0316   REF   1                6334  7 7671 1            MASK   B12T14
0317                           6335  0 0006 1            EXTEND
0318   REF  38  LAST 1010     6336  7 4706 C            MP     BIT5         EACH TRANSFER VECTOR ENTRY IS TWO WORDS.
0319   REF 282  LAST 1082     6337  50 000 1  ITR0      INDEX  A
0320   REF   1                6340  1 6341 C            TCF    STORJUMP
```

P0321 STORE CODE JUMP TABLE. CALLS THE APPROPRIATE STORING ROUTINE AND EXITS TO DANZIG OR TO ADDRESS WITH
R0323 A SUPPLIED OPERATION CODE.

R03231 STORE STORE,1 AND STORE,2 RETURN TO DANZIG, THUS RESETTING THE EBANK TO ITS STATE AT INTPRET.

```
0324  REF   1                6341  0 6371 1  STORJUMP TC    STORE          STORE.
0325  REF   9  LAST  751      6342  1 6030 C            TCF   DANZIG        PICK UP NEW OP CODE(S).
0326  REF   1                6343  0 6363 1            TC    STORE,1
0327  REF  10  LAST 1087      6344  1 6030 C            TCF   DANZIG
0328  REF   1                6345  0 6366 1            TC    STORE,2
0329  REF  11  LAST 1087      6346  1 6030 C            TCF   DANZIG

0330  REF   2  LAST 1087      6347  0 6371 1            TC    STORE          STODL.
0331  REF   1                6350  1 6427 1            TCF   DODLOAD

0332  REF   3  LAST 1087      6351  0 6371 1            TC    STORE          STODL WITH INDEXED LOAD ADDRESS.
0333  REF   1                6352  1 6113 C            TCF   DODLOAD*

0334  REF   4  LAST 1087      6353  0 6371 1            TC    STORE          STOVL.
0335  REF   1                6354  1 6432 C            TCF   DOVLOAD

0336  REF   5  LAST 1087      6355  0 6371 1            TC    STORE          STOVL WITH INDEXED LOAD ADDRESS.
0337  REF   1                6356  1 6435 1            TCF   DOVLOAD*
0338  REF   6  LAST 1087      6357  0 6371 1            TC    STORE          STOTC.
0339  REF   1                6360  3 4723 C            CAF   CALLCODE
0340  REF  26  LAST 1082      6361  54 020 1           TS    CYR
0341  REF   1                6362  1 6221 1            TCF   15BITADR       GET A 15 BIT ADDRESS.
```

P0342 STORE CODE ADDRESS PROCESSOR.

```
0343  REF  21  LAST 1078   6363  50 120 1  STORE,1  INDEX  FIXLOC
0344  REF  49  LAST 1078   6364  4 0046 1           CS     X1
0345  REF   1              6365  1 6370 1           TCF    PRESTORE

0346  REF  22  LAST 1088   6366  50 120 1  STORE,2  INDEX  FIXLOC
0347  REF  26  LAST  887   6367  4 0047 0           CS     X2
0348  REF  16  LAST 1086   6370  26 116 0  PRESTORE ADS    ADDRWD        RESULTANT ADDRESS IS IN ERASABLE.

0349  REF  17  LAST 1088   6371  4 0116 0  STORE    CS     ADDRWD
0350  REF   2  LAST  938   6372  6 4727 1           AD     DEC45
0351  REF 283  LAST 1086   6373  10 000 0           CCS    A             DOES THE ADDRESS POINT TO THE WORK AREA?
0352  REF  23  LAST 1088   6374  3 0120 1           CA     FIXLOC        YES.
0353  REF   1              6375  1 6402 0           TCF    AHEAD5
0354  REF   5  LAST 1078   6376  3 4744 1           CA     OCT1400       NO.  SET EBANK & MAKE UP SUBADDRESS.
0355  REF  18  LAST 1088   6377  56 116 1           XCH    ADDRWD
0356  REF  48  LAST 1078   6400  54 003 0           TS     EBANK
0357  REF  10  LAST 1078   6401  7 4373 0           MASK   LOW8
0358  REF  19  LAST 1088   6402  26 116 0  AHEAD5   ADS    ADDRWD
```

```
P0359           STORING ROUTINES. STORE DP, TP, OR VECTOR AS INDICATED BY MODE.

 0360                           6403  0 0006 1  STARTSTO EXTEND                  MPAC,+1 MUST BE STORED IN ANY EVENT.
R0361           ITRACE (5) REFERS TO "STARTSTO".
 0362   REF 292  LAST 1075      6404  3 0155 C            DCA     MPAC
 0363   REF  20  LAST 1088      6405  50 116 1            INDEX   ADDRWD
 0364                           6406  52 001 1            DXCH    0

 0365   REF   8  LAST 1082      6407  10 163 1            CCS     MODE
 0366   REF   1                 6410  1 6423 C            TCF     TSTORE
 0367   REF 228  LAST 1073      6411  0 0002 C            TC      Q

 0368                           6412  0 0006 1  VSTORE    EXTEND
 0369   REF 293  LAST 1089      6413  3 0160 C            DCA     MPAC +3
 0370   REF  21  LAST 1089      6414  50 116 1            INDEX   ADDRWD
 0371                           6415  52 003 C            DXCH    2

 0372                           6416  0 0006 1            EXTEND
 0373   REF 294  LAST 1089      6417  3 0162 1            DCA     MPAC +5
 0374   REF  22  LAST 1089      6420  50 116 1            INDEX   ADDRWD
 0375                           6421  52 005 C            DXCH    4
 0376   REF 229  LAST 1089      6422  0 0002 C            TC      Q

 0377   REF 295  LAST 1089      6423  3 0156 C  TSTORE     CA      MPAC +2
 0378   REF  23  LAST 1089      6424  50 116 1            INDEX   ADDRWD
 0379                           6425  54 002 1            TS      2
 0380   REF 230  LAST 1089      6426  0 0002 C            TC      Q
```

P0381 ROUTINES TO BEGIN PROCESSING OF THE SECOND ADDRESS ASSOCIATED WITH ALL STORE-TYPE CODES EXCEPT STORE
R0383 ITSELF.

```
 0384   REF   1                  6427  3 7701 C  DODLOAD  CAF    DLOADCOD
 0385   REF  27  LAST 1087       6430  54 020 1            TS     CYR
 0386   REF   1                  6431  1 6055 C            TCF    DIRADRES        GO GET A DIRECT ADDRESS.

 0387   REF   1                  6432  3 4674 C  DOVLOAD  CAF    VLOADCOD
 0388   REF  28  LAST 1090       6433  54 020 1            TS     CYR
 0389   REF   2  LAST 1090       6434  1 6055 C            TCF    DIRADRES

 0390   REF   1                  6435  3 6056 1  DOVLOAD* CAF    VLOAD*
 0391   REF   2  LAST 1087       6436  1 6114 1            TCF    DODLOAD* +1     PROLOGUE TO INDEX ROUTINE.
```

P0392 THE FOLLOWING LOAD INSTRUCTIONS ARE PROVIDED FOR LOADING THE MULTI-PURPOSE ACCUMULATOR MPAC.

```
0394   REF  24  LAST 1089   6437  5C 116 1  TLOAD    INDEX  ADDRWD
0395                        6440  3 0002 C            CA     2          LOAD A TRIPLE PRECISION ARGUMENT INTO
0396   REF 296  LAST 1089   6441  54 156 1            TS     MPAC +2    THE FIRST THREE MPAC REGISTERS, WITH THE
0397                        6442  0 0006 1            EXTEND            CONTENTS OF THE OTHER FOUR IRRELEVANT.
0398   REF  25  LAST 1091   6443  5 0116 1            INDEX  ADDRWD
0399                        6444  3 0001 0            DCA    0
0400   REF 297  LAST 1091   6445  52 155 1            DXCH   MPAC
0401   REF 133  LAST 1055   6446  3 4712 1   TMODE    CAF    ONE
0402   REF   1              6447  1 6027 C            TCF    NEWMODE    DECLARE TRIPLE PRECISION MODE.

0403                        6450  22 007 C   SLOAD    ZL                LOAD A SINGLE PRECISION NUMBER INTO
0404   REF  26  LAST 1091   6451  50 116 1            INDEX  ADDRWD     MPAC, SETTING MPAC+1,2 TO ZERO. THE
0405                        6452  3 0000 1            CA     0          CONTENTS OF THE REMAINING MPAC REGISTERS
0406   REF   1              6453  1 6024 C            TCF    SLOAD2     ARE IRRELEVANT.

0407                        6454  0 0006 1   VLOAD    EXTEND            LOAD A DOUBLE PRECISION VECTOR INTO
0408   REF  27  LAST 1091   6455  5 0116 1            INDEX  ADDRWD     MPAC,+1, MPAC+3,4, AND MPAC+5,6. THE
0409                        6456  3 0001 C            DCA    0          CONTENTS OF MPAC +2 ARE IRRELEVANT.
0410   REF 298  LAST 1091   6457  52 155 1            DXCH   MPAC

0411                        6460  0 0006 1   ENDVLOAD EXTEND            POVL COMES HERE TO FINISH UP FOR DP, TP.
0412   REF  28  LAST 1091   6461  5 0116 1            INDEX  ADDRWD
0413                        6462  3 0003 1            DCA    2
0414   REF 299  LAST 1091   6463  52 160 1            DXCH   MPAC +3

0415                        6464  0 0006 1   +4       EXTEND            TPDVL FINISHES HERE.
0416   REF  29  LAST 1091   6465  5 0116 1            INDEX  ADDRWD
0417                        6466  3 0005 1            DCA    4
0418   REF 300  LAST 1091   6467  52 162 C            DXCH   MPAC +5

0419   REF 134  LAST 1091   6470  4 4712 C   VMODE    CS     ONE        DECLARE VECTOR MODE.
0420   REF   2  LAST 1091   6471  1 6027 C            TCF    NEWMODE
```

P0421 THE FOLLOWING INSTRUCTIONS ARE PROVIDED FOR STORING OPERANDS IN THE PUSHDOWN LIST:

R0423 1. PUSH PUSHDOWN AND NO LOAD.
R0424 2. PDDL PUSHDOWN AND DOUBLE PRECISION LOAD.
R0425 3. PDVL PUSHDOWN AND VECTOR LOAD.

```
0426                                6472  0 0006 1  PDDL    EXTEND
0427  REF  30  LAST 1091          6473  5 0116 1           INDEX  ADDRWD        LOAD MPAC,+1, PUSHING THE FORMER
0428                                6474  3 0001 C           DCA    0             CONTENTS DOWN.
0429  REF 301  LAST 1091          6475  52 155 1           DXCH   MPAC
0430  REF   2  LAST 1080          6476  50 166 C           INDEX  PUSHLOC
0431                                6477  52 001 1           DXCH   0

0432  REF   9  LAST 1089          6500  50 163 C           INDEX  MODE          ADVANCE THE PUSHDOWN POINTER APPRO-
0433  REF   3  LAST 1080          6501  3 6213 1           CAF    NO.WDS        PRIATELY.
0434  REF   3  LAST 1092          6502  26 166 1           ADS    PUSHLOC

0435  REF  10  LAST 1092          6503  10 163 1           CCS    MODE
0436  REF   1                     6504  1 6521 C           TCF    ENDTPUSH
0437  REF   1                     6505  1 6517 C           TCF    ENDDPUSH

0438  REF  11  LAST 1092          6506  54 163 1           TS     MODE          NOW DP.
0439  REF 302  LAST 1092          6507  54 156 1  ENDVPUSH TS     MPAC +2
0440  REF 303  LAST 1092          6510  52 160 1           DXCH   MPAC +3       PUSH DOWN THE REST OF THE VECTOR HERE.
0441  REF   4  LAST 1092          6511  50 166 C           INDEX  PUSHLOC
0442                                6512  51'775 C           DXCH   0 -4

0443  REF 304  LAST 1092          6513  52 162 C           DXCH   MPAC +5
0444  REF   5  LAST 1092          6514  50 166 C           INDEX  PUSHLOC
0445                                6515  51'777 1           DXCH   0 -2

0446  REF  12  LAST 1087          6516  1 6030 C           TCF    DANZIG

0447  REF 305  LAST 1092          6517  54 156 1  ENDDPUSH TS     MPAC +2       SET MPAC +2 TO ZERO AND EXIT ON DP.
0448  REF  13  LAST 1092          6520  1 6030 C           TCF    DANZIG

0449  REF  12  LAST 1092          6521  54 163 1  ENDTPUSH TS     MODE
0450  REF 306  LAST 1092          6522  56 156 C           XCH    MPAC +2       ON TRIPLE, SET MPAC +2 TO ZERO, PUSHING
0451  REF   6  LAST 1092          6523  50 166 C  +2       INDEX  PUSHLOC       DOWN THE OLD CONTENTS
0452                                6524  53'777 C           TS     0 -1
0453  REF  14  LAST 1092          6525  1 6030 C           TCF    DANZIG
```

P0454 PDVL - PUSHDOWN AND VECTOR LOAD.

```
0455                              6526  0 0006 1  PDVL    EXTEND                 RELOAD MPAC AND PUSH DOWN ITS CONTENTS.
0456  REF  31  LAST 1092         6527  5 0116 1          INDEX   ADDRWD
0457                              6530  3 0001 0          DCA     0
0458  REF 307  LAST 1092         6531  52 155 1          DXCH    MPAC
0459  REF   7  LAST 1092         6532  50 166 0          INDEX   PUSHLOC
0460                              6533  52 001 1          DXCH    0

0461  REF  13  LAST 1092         6534  50 163 0          INDEX   MODE             ADVANCE THE PUSHDOWN POINTER.
0462  REF   4  LAST 1092         6535  3 6213 1          CAF     NO.WDS
0463  REF   8  LAST 1093         6536  26 166 1          ADS     PUSHLOC

0464  REF  14  LAST 1093         6537  10 163 1          CCS     MODE             TEST PAST MODE.
0465  REF   1                     6540  1 6557 1          TCF     TPDVL
0466  REF   1                     6541  1 6460 1          TCF     ENDVLOAD         JUST LOAD LAST FOUR REGISTERS ON DP.

0467                              6542  0 0006 1  VPDVL   EXTEND                 PUSHDOWN AND RE-LOAD LAST TWO COMPONENTS
0468  REF  32  LAST 1093         6543  5 0116 1          INDEX   ADDRWD
0469                              6544  3 0003 1          DCA     2
0470  REF 308  LAST 1093         6545  52 160 1          DXCH    MPAC +3
0471  REF   9  LAST 1093         6546  50 166 0          INDEX   PUSHLOC
0472                              6547  51'775 0          DXCH    0 -4

0473                              6550  0 0006 1          EXTEND
0474  REF  33  LAST 1093         6551  5 0116 1          INDEX   ADDRWD
0475                              6552  3 0005 1          DCA     4
0476  REF 309  LAST 1093         6553  52 162 0          DXCH    MPAC +5
0477  REF  10  LAST 1093         6554  50 166 0          INDEX   PUSHLOC
0478                              6555  51'777 1          DXCH    0 -2

0479  REF  15  LAST 1092         6556  1 6030 0          TCF     DANZIG

0480                              6557  0 0006 1  TPDVL   EXTEND                 ON TP, WE MUST LOAD THE Y COMPONENT
0481  REF  34  LAST 1093         6560  5 0116 1          INDEX   ADDRWD           BEFORE STORING MPAC +2 INCASE THIS IS A
0482                              6561  3 0003 1          DCA     2                PUSHUP.
0483  REF 310  LAST 1093         6562  52 160 1          DXCH    MPAC +3

0484  REF 311  LAST 1093         6563  3 0156 0          CA      MPAC +2
0485  REF  11  LAST 1093         6564  50 166 0          INDEX   PUSHLOC          IN DP.
0486                              6565  53'777 0          TS      0 -1
0487  REF   2  LAST 1093         6566  1 6464 0          TCF     ENDVLOAD +4
```

R0488 SSP (STORE SINGLE PRECISION) IS EXECUTED HERE.

```
0489  REF  18  LAST 1086         6567  24 164 1  SSP     INCR    LOC              PICK UP THE WORD FOLLOWING THE GIVEN
0490  REF  19  LAST 1093         6570  50 164 1          INDEX   LOC              ADDRESS AND STORE IT AT X.
0491                              6571  3 0000 1          CA      0
0492  REF  35  LAST 1093         6572  50 116 1  STORE1  INDEX   ADDRWD           SOME INDEX AND MISCELLANEOUS OPS END
0493                              6573  54 000 0          TS      0                HERE.
```

L INTERPRETER USER'S PAGE NO. 21 EO S3

0494 REF 16 LAST 1093 6574 1 6030 C TCF DANZIG

P0495 SEQUENCE CHANGING AND SUBROUTINE CALLING OPTIONS.

R0496 THE FOLLOWING OPERATIONS ARE AVAILABLE FOR SEQUENCING CHANGING, BRANCHING, AND CALLING SUBROUTINES:

R0498 1. GOTO GO TO.
R0499 2. CALL CALL SUBROUTINE SETTING QPRET.
R0500 3. CGOTO COMPUTED GO TO.
R0501 4. CCALL COMPUTED CALL.
R0502 7. BPL BRANCH IF MPAC POSITIVE OR ZERO.
R0503 8. BZE BRANCH IF MPAC ZERO.
R0504 9. BMN BRANCH IF MPAC NEGATIVE NON-ZERO.

```
0505  REF  20  LAST 1093   6575  24 164 1  CCALL   INCR    LOC        MAINTAIN LOC FOR QPRET COMPUTATION.
0506  REF  21  LAST 1095   6576  50 164 1          INDEX   LOC
0507                       6577  3 0000 1          CAF     0          GET BASE ADDRESS OF CADR LIST.
0508  REF  36  LAST 1093   6600  50 116 1          INDEX   ADDRWD
0509                       6601  6 0000 1          AD      0          ADD INCREMENT.
0510  REF  16  LAST 1086   6602  54 004 1          TS      FBANK      SELECT DESIRED CADR.
0511  REF  16  LAST 1078   6603  7 4747 C          MASK    LOWIO
0512  REF 284  LAST 1088   6604  5C 000 1          INDEX   A
0513                       6605  3 2000 C          CAF     10000
0514  REF   6  LAST 1081   6606  54 117 1          TS      POLISH

0515  REF   5  LAST 1086   6607  3 0165 C  CALL    CA      BANKSET    FOR ANY OF THE CALL OPTIONS, MAKE UP THE
0516  REF   2  LAST 1082   6610  7 4364 C          MASK    BANKMASK   ADDRESS OF THE NEXT OP-CODE PAIR/STORE
0517  REF   3  LAST 1095   6611  6 4364 1          AD      BANKMASK   CODE AND LEAVE IT IN QPRET.  NOTE THAT
0518  REF  22  LAST 1095   6612  6 0164 1          AD      LOC        BANKMASK = -(2000 - 1).
0519  REF  24  LAST 1088   6613  50 120 1          INDEX   FIXLOC
0520  REF  17  LAST  745   6614  54 052 1          TS      QPRET

0521  REF   7  LAST 1095   6615  3 0117 C  GOTO    CA      POLISH     BASIC BRANCHING SEQUENCE.
0522  REF   4  LAST 1078   6616  7 7711 C  +1      MASK    HIGH4
0523                       6617  0 0006 1          EXTEND
0524  REF   1              6620  1 6631 1          BZF     GOTOERS    SEE IF ADDRESS POINTS TO FIXED OR ERAS.
0525  REF   6  LAST 1095   6621  3 0165 C  +4      CA      BANKSET    SET EBANK PART OF BBANK. NEXT, SET UP
0526  REF  18  LAST 1075   6622  54 006 C          TS      BBANK      FBANK. THE COMBINATION IS PICKED UP &
0527  REF   8  LAST 1095   6623  3 0117 C          CA      POLISH     PUT INTO BANKSET AT INTPRET +2.
0528  REF  17  LAST 1095   6624  54 004 1          TS      FBANK
0529  REF  17  LAST 1095   6625  7 4747 C          MASK    LOWIO
0530  REF   2  LAST 1078   6626  6 4700 1          AD      2K
0531  REF  23  LAST 1095   6627  54 164 C          TS      LOC
0532  REF 228  LAST 1074   6630  1 6011 C          TCF     INTPRET +3

0533                  E3,1400                     EBANK=  1400       SO YUL DOESN'T CUSS THE "CA 1400" BELOW.

0534  REF   9  LAST 1095   6631  3 0117 C  GOTOERS CA      POLISH     THE GIVEN ADDRESS IS IN ERASABLE - SEE
0535  REF   2  LAST 1077   6632  6 6220 1          AD      -ENDVAC    IF RELATIVE TO THE WORK AREA.
0536  REF 285  LAST 1095   6633  10 000 C          CCS     A
0537  REF  10  LAST 1095   6634  3 0117 C          CA      POLISH     GENERAL ERASABLE.
0538  REF   1              6635  1 6644 C          TCF     GOTOGE
```

```
0539   REF  25  LAST 1095     6636  3 0120 1          CA      FIXLOC      WORK AREA.
0540   REF  11  LAST 1095     6637  6 0117 0          AD      POLISH
0541   REF 286  LAST 1095     6640  50 000 1          INDEX   A           USE THE GIVEN ADDRESS AS THE ADDRESS OF
0542                          6641  3 0000 1          CA      0           THE BRANCH ADDRESS.
0543   REF  12  LAST 1096     6642  54 117 1          TS      POLISH
0544   REF   1                6643  1 6616 1          TCF     GOTO +1     ALLOWS ARBITRARY INDIRECTNESS LEVELS.

0545   REF  49  LAST 1088     6644  54 003 0  GOTOGE  TS      EBANK
0546   REF  11  LAST 1088     6645  7 4373 0          MASK    LOW8
0547   REF 287  LAST 1096     6646  50 000 1          INDEX   A           USE THE GIVEN ADDRESS AS THE ADDRESS OF
0548                          6647  3 1400 1          CA      1400        THE BRANCH ADDRESS.
0549   REF  13  LAST 1096     6650  54 117 1          TS      POLISH
0550   REF   2  LAST 1096     6651  1 6616 1          TCF     GOTO +1

0551   REF  24  LAST 1095     6652  50 164 1  CGOTO   INDEX   LOC         COMPUTED GO TO. PICK UP ADDRESS OF CADR
0552                          6653  3 0001 0          CA      1           LIST.
0553   REF  37  LAST 1095     6654  50 116 1          INDEX   ADDRWD      ADD MODIFIER.
0554                          6655  6 0000 1          AD      0
0555   REF  18  LAST 1095     6656  54 004 1          TS      FBANK       SELECT GOTO ADDRESS.
0556   REF  18  LAST 1095     6657  7 4747 0          MASK    LOW10
0557   REF 288  LAST 1096     6660  50 000 1          INDEX   A
0558                          6661  3 2000 0          CA      10000
0559   REF  14  LAST 1096     6662  54 117 1          TS      POLISH
0560   REF   3  LAST 1096     6663  1 6616 1          TCF     GOTO +1     WITH ADDRESS IN A.

0561   REF   7  LAST 1095     6664  3 0165 0  SWBRANCH CA     BANKSET     SWITCH INSTRUCTIONS WHICH ELECT TO
0562   REF  19  LAST 1096     6665  54 004 1          TS      FBANK       BRANCH COME HERE TO DO SO.
0563   REF  25  LAST 1096     6666  50 164 1          INDEX   LOC
0564                          6667  3 0001 0          CA      1
0565   REF  15  LAST 1096     6670  54 117 1          TS      POLISH
0566   REF   4  LAST 1096     6671  1 6616 1          TCF     GOTO +1
```

```
R0567           TRIPLE PRECISION BRANCHING ROUTINE. IF CALLING TC IS AT L, RETURN IS AS FOLLOWS:

R0569           L+1  IF MPAC IS GREATER THAN ZERO.
R0570           L+2  IF MPAC IS EQUAL TO +0 OR -0.
R0571           L+3  IF MPAC IS LESS THAN ZERO.


0572  REF 312  LAST 1093    6672  10 154 C  BRANCH   CCS    MPAC
0573  REF 231  LAST 1085    6673  0 0002 0           TC     Q
0574                        6674  1 6676 1           TCF    +2              ON ZERO.
0575  REF   1               6675  1 6710 C           TCF    NEG

0576  REF 313  LAST 1097    6676  10 155 1           CCS    MPAC +1
0577  REF 232  LAST 1097    6677  0 0002 C           TC     Q
0578                        6700  1 6702 C           TCF    +2
0579  REF   2  LAST 1097    6701  1 6710 C           TCF    NEG

0580  REF 314  LAST 1097    6702  10 156 1           CCS    MPAC +2
0581  REF 233  LAST 1097    6703  0 0002 0           TC     Q
0582                        6704  1 6706 1           TCF    +2
0583  REF   3  LAST 1097    6705  1 6710 C           TCF    NEG

0584  REF 234  LAST 1097    6706  50 002 C  Q+1      INDEX  Q
0585                        6707  0 0001 0           TC     1

0586  REF 235  LAST 1097    6710  50 002 C  NEG      INDEX  Q               IF FIRST NON-ZERO REGISTER WAS NEGATIVE.
0587                        6711  0 0002 C           TC     2

0588  REF   4  LAST 1097    6710                Q+2  =      NEG

R0589           ITRACE (3) REFERS TO "EXIT".
0590  REF   8  LAST 1096    6712  3 0165 C  EXIT     CA     BANKSET         RESTORE USER'S BANK SETTING, AND LEAVE
0591  REF  19  LAST 1095    6713  54 006 C           TS     BBANK           INTERPRETIVE MODE.
0592  REF  26  LAST 1096    6714  50 164 1           INDEX  LOC
0593                        6715  0 0001 C           TC     1
```

R0594 SECTION 3 - ADD/SUBTRACT PACKAGE.

R0595 THE FOLLOWING OPERATIONS ARE PROVIDED FOR ADDING TO AND SUBTRACTING FROM THE MULTI-PURPOSE ACCUMULATOR
R0597 MPAC:

R0598 1. DAD DOUBLE PRECISION ADD.
R0599 2. DSU DOUBLE PRECISION SUBTRACT.
R0600 3. BDSU DOUBLE PRECISION SUBTRACT FROM.

R0601 4. TAD TRIPLE PRECISION ADD.

R0602 5. VAD VECTOR ADD.
R0603 6. VSU VECTOR SUBTRACT.
R0604 7. BVSU VECTOR SUBTRACT FROM.

R0605 THE INTERPRETIVE OVERFLOW INDICATOR OVFIND IS SET NON-ZERO IF OVERFLOW OCCURS IN ANY OF THE ABOVE.

```
0607  REF  44  LAST 1074    6716  3 4674 C  VSU     CAF     BIT15          CHANGES 0 TO DCS.
0608                        6717  1 6721 1          TCF     +2

0609  REF  13  LAST  950    6720  3 4371 C  VAD     CAF     PRIO30         CHANGES 0 TO DCA.
0610  REF  38  LAST 1096    6721  26 116 C          ADS     ADDRWD
0611                        6722  0 0006 1          EXTEND
0612  REF  39  LAST 1098    6723  5 0116 1          INDEX   ADDRWD
0613  REF   2  LAST  422    6724  00 003 1          READ    HISCALAR       DCA  2  OR  DCS  2
0614  REF 315  LAST 1097    6725  20 160 1          DAS     MPAC +3
0615                        6726  0 0006 1          EXTEND                 CHECK OVERFLOW.
0616                        6727  1 6731 C          BZF     +2
0617  REF   1               6730  0 6763 C          TC      OVERFLWY

0618                        6731  0 0006 1          EXTEND
0619  REF  40  LAST 1098    6732  5 0116 1          INDEX   ADDRWD
0620  REF   8  LAST 1030    6733  00 005 1          READ    CHAN5          DCA  4  OR  DCS  4
0621  REF 316  LAST 1098    6734  20 162 C          DAS     MPAC +5
0622                        6735  0 0006 1          EXTEND
0623                        6736  1 6740 C          BZF     +2
0624  REF   1               6737  0 6760 C          TC      OVERFLWZ

0625                        6740  0 0006 1          EXTEND
0626  REF  41  LAST 1098    6741  5 0116 1          INDEX   ADDRWD
0627  REF  15  LAST 1046    6742  00 001 C          READ    LCHAN          DCA  0  OR  DCS  0
0628  REF   1               6743  1 6747 1          TCF     ENDVXV

0629                        6744  0 0006 1  DAD     EXTEND
0630  REF  42  LAST 1098    6745  5 0116 1          INDEX   ADDRWD
0631                        6746  3 0001 C          DCA     0
0632  REF 317  LAST 1098    6747  20 155 1  ENDVXV  DAS     MPAC           VXV FINISHES HERE.
0633                        6750  0 0006 1          EXTEND
0634  REF  17  LAST 1094    6751  1 6030 C          BZF     DANZIG
```

```
0635   REF   1                  6752  0 6766 C  SETOVF   TC      OVERFLOW
0636   REF  18  LAST 1098      6753  1 6030 C            TCF     DANZIG
```

```
0637                          6754  0 0006 1  CSU       EXTEND
0638  REF  43  LAST 1098     6755  5 0116 1            INDEX   ADDRWD
0639                          6756  4 0001 1            DCS     0
0640  REF   2  LAST 1098     6757  1 6747 1            TCF     ENDVXV

0641  REF 166  LAST 1072     6760  54 001 1  OVERFLWZ  TS      L         ENTRY FOR THIRD COMPONENT.
0642  REF  25  LAST 103E     6761  3 4715 0            CAF     FIVE
0643                          6762  1 6765 1            TCF     +3

0644  REF 167  LAST 110C     6763  54 001 1  OVERFLWY  TS      L         ENTRY FOR SECOND COMPONENT.
0645  REF  40  LAST 1058     6764  3 6214 0            CAF     THREE
0646  REF 16E  LAST 110C     6765  56 001 0            XCH     L

0647  REF 2E9  LAST 109E     6766  50 000 1  OVERFLOW  INDEX   A         ENTRY FOR 1ST COMP OR DP (L=0).
0648  REF   3  LAST 1033     6767  4 4673 0            CS      LIMITS    PICK UP POSMAX OR NEGMAX.
0649  REF  44  LAST  367     6770  54 130 1            TS      BUF
0650                          6771  0 0006 1            EXTEND
0651  REF 290  LAST 110C     6772  24 000 1            AUG     A         FORCE OVERFLOW.
0652  REF 169  LAST 110C     6773  50 001 0            INDEX   L
0653  REF 318  LAST 1098     6774  26 155 1            ADS     MPAC +1
0654                          6775  54 007 1            TS      7
0655  REF 207  LAST 1074     6776  3 4714 1            CAF     ZERO
0656  REF  45  LAST 1100     6777  6 0130 0            AD      BUF
0657  REF 170  LAST 110C     7000  50 001 0            INDEX   L
0658  REF 319  LAST 110C     7001  26 154 0            ADS     MPAC
0659                          7002  54 007 1            TS      7
0660  REF 236  LAST 1097     7003  0 0002 0            TC      Q         NO OVERFLOW EXIT.
0661  REF   1                 7004  1 7121 0            TCF     SETOVF2   SET OVFIND AND EXIT.

0662                          7005  0 0006 1  BVSU      EXTEND
0663  REF  44  LAST 110C     7006  5 0116 1            INDEX   ADDRWD
0664                          7007  3 0003 1            DCA     2
0665  REF 320  LAST 110C     7010  52 160 1            DXCH    MPAC +3
0666                          7011  0 0006 1            EXTEND
0667                          7012  4 0001 1            DCOM
0668  REF 321  LAST 1100     7013  20 160 1            DAS     MPAC +3
0669                          7014  0 0006 1            EXTEND
0670                          7015  1 7017 1            BZF     +2
0671  REF   2  LAST 1098     7016  0 6763 0            TC      OVERFLWY

0672                          7017  0 0006 1            EXTEND
0673  REF  45  LAST 1100     7020  5 0116 1            INDEX   ADDRWD
0674                          7021  3 0005 1            DCA     4
0675  REF 322  LAST 110C     7022  52 162 0            DXCH    MPAC +5
0676                          7023  0 0006 1            EXTEND
0677                          7024  4 0001 1            DCOM
0678  REF 323  LAST 110C     7025  20 162 0            DAS     MPAC +5
0679                          7026  0 0006 1            EXTEND
0680                          7027  1 7031 0            BZF     +2
0681  REF   2  LAST 1098     7030  0 6760 0            TC      OVERFLWZ
```

```
0682                              7031  0 0006 1  BDSU      EXTEND
0683   REF  46  LAST 1100        7032  5 0116 1            INDEX   ADDRWD
0684                              7033  3 0001 C            DCA     0
0685   REF 324  LAST 1100        7034  52 155 1            DXCH    MPAC
0686                              7035  0 0006 1            EXTEND
0687                              7036  4 0001 1            DCOM
0688   REF   3  LAST 1100        7037  1 6747 1            TCF     ENDVXV
```

P0689 TRIPLE PRECISION ADD ROUTINE.

```
0690                                7040  0 0006 1  TAD     EXTEND
0691  REF  47  LAST 1101           7041  5 0116 1          INDEX   ADDRWD
0692                                7042  3 0002 C          DCA     1               ADD MINOR PARTS FIRST.
0693  REF 325  LAST 1101           7043  20 156 1          DAS     MPAC +1
0694  REF  48  LAST 1102           7044  50 116 1          INDEX   ADDRWD
0695                                7045  6 0000 1          AD      0
0696  REF 326  LAST 1102           7046  6 0154 1          AD      MPAC
0697  REF 327  LAST 1102           7047  54 154 C          TS      MPAC
0698  REF  19  LAST 1099           7050  1 6030 C          TCF     DANZIG

0699  REF   1                      7051  1 6752 C          TCF     SETOVF          SET OVFIND IF SUCH OCCURS.
```

R0700 ARITHMETIC SUBROUTINES REQUIRED IN FIXED-FIXED.

R0701 1. DMPSUB DOUBLE PRECISION MULTIPLY. MULTIPLY THE CONTENTS OF MPAC,+1 BY THE DP WORD WHOSE ADDRESS
R0703 IS IN ADDRWD AND LEAVE A TRIPLE PRECISION RESULT IN MPAC.
R0705 2. ROUNDSUB ROUND THE TRIPLE PRECISON CONTENTS OF MPAC TO DOUBLE PRECISION.
R0707 3. DOTSUB TAKE THE DOT PRODUCT OF THE VECTOR IN MPAC AND THE VECTOR WHOSE ADDRESS IS IN ADDRWD
R0709 AND LEAVE THE TRIPLE PRECISION RESULT IN MPAC.
R0710 4. POLY USING THE CONTENTS OF MPAC AS A DP ARGUMENT, EVALUATE THE POLYNOMIAL WHOSE DEGREE AND
R0712 COEFFICIENTS IMMEDIATELY FOLLOW THE TC POLY INSTRUCTION (SEE ROUTINE FOR DETAILS.)

```
0714  REF 237  LAST 1100   7052  50 002 C  DMP      INDEX  Q        BASIC SUBROUTINE FOR USE BY PINBALL, ETC
0715                       7053  3 0000 1           CAF    0        ADRES OF ARGUMENT FOLLOWS  TC DMP  .
0716  REF 238  LAST 1103   7054  24 002 C           INCR   Q
0717  REF  49  LAST 1102   7055  54 116 C  -1       TS     ADDRWD   (PROLOGUE FOR SETTING ADDRWD.)

0718  REF  50  LAST 1103   7056  50 116 1  DMPSUB   INDEX  ADDRWD   GET MINOR PART OF OPERAND AT C(ADDRWD).
0719                       7057  3 0001 C           CA     1
0720  REF 328  LAST 1102   7060  54 156 1           TS     MPAC +2  THIS WORKS FOR SQUARING MPAC AS WELL.
0721  REF 208  LAST 1100   7061  3 4714 1           CAF    ZERO     SET MPAC +1 TC ZERO SO WE CAN ACCUMULATE
0722  REF 329  LAST 1103   7062  56 155 C           XCH    MPAC +1  THE PARTIAL PRODUCTS WITH DAS
0723  REF   8  LAST 1071   7063  54 135 1           TS     MPTEMP   INSTRUCTIONS.
0724                       7064  0 0006 1           EXTEND
0725  REF 330  LAST 1103   7065  7 0156 1           MP     MPAC +2  MINOR OF MPAC X MINOR OF C(ADDRWD).

0726  REF 331  LAST 1103   7066  56 156 C           XCH    MPAC +2  DISCARD MINOR PART OF ABOVE RESULT AND
0727                       7067  0 0006 1           EXTEND          FORM MAJOR OF MPAC X MINOR OF C(ADDRWD).
0728  REF 332  LAST 1103   7070  7 0154 C           MP     MPAC
0729  REF 333  LAST 1103   7071  20 156 1           DAS    MPAC +1  GUARANTEED NO OVERFLOW.

0730  REF  51  LAST 1103   7072  50 116 1           INDEX  ADDRWD   GET MAJOR PART OF ARGUMENT AT C(ADDRWD).
0731                       7073  3 0000 1           CA     0
0732  REF   9  LAST 1103   7074  56 135 C           XCH    MPTEMP   SAVE AND BRING OUT MINOR OF MPAC.
0733                       7075  0 0006 1  DMPSUB2  EXTEND
0734  REF  10  LAST 1103   7076  7 0135 1           MP     MPTEMP   MAJOR OF C(ADDRWD) X MINOR OF MPAC.
0735  REF 334  LAST 1103   7077  20 156 1           DAS    MPAC +1  ACCUMULATE, SETTING A TO NET OVERFLOW.

0736  REF 335  LAST 1103   7100  56 154 1           XCH    MPAC     SETTING MPAC TO 0 OR +-1.
0737                       7101  0 0006 1           EXTEND
0738  REF  11  LAST 1103   7102  7 0135 1           MP     MPTEMP   MAJOR OF MPAC X MAJOR OF C(ADDRWD).
0739  REF 336  LAST 1103   7103  20 155 1           DAS    MPAC     GUARANTEED NO OVERFLOW.
0740  REF 239  LAST 1103   7104  0 0002 C           TC     Q        49 MCT = .573 MS. INCLUDING RETURN.
```

```
P0741           RCUND MPAC TC DOUBLE PRECISICN, SETTING OVFIND ON THE RARE EVENT OF OVERFLOW.

 0743   REF 209  LAST 1103    7105  3 4714 1  ROUNDSUB CAF    ZERO      SET MPAC +2 = 0 FOR SCALARS AND CHANGE
 0744   REF  15  LAST 1093    7106  54 163 1   +1      TS     MODE      MODE TO DP.

 0745   REF 337  LAST 1103    7107  56 156 C  VROUND  XCH    MPAC +2   BUT WE NEEDNT TAKE THE TIME FOR VECTORS.
 0746                         7110  6 0000 1           DOUBLE
 0747   REF 171  LAST 1100    7111  54 001 1           TS     L
 0748   REF 240  LAST 1103    7112  0 0002 0           TC     Q

 0749   REF 338  LAST 1104    7113  6 0155 C           AD     MPAC +1   ADD ROUNDING BIT IF MPAC +2 WAS GREATER
 0750   REF 339  LAST 1104    7114  54 155 1           TS     MPAC +1   THAN .5 IN MAGNITUDE.
 0751   REF 241  LAST 1104    7115  0 0002 C           TC     Q

 0752   REF 340  LAST 1104    7116  6 0154 1           AD     MPAC      PROPAGATE INTERFLOW.
 0753   REF 341  LAST 1104    7117  54 154 C           TS     MPAC
 0754   REF 242  LAST 1104    7120  0 0002 C           TC     Q

 0755   REF   2  LAST  841    7121  54 121 1  SETOVF2  TS     OVFIND    (RARE).
 0756   REF 243  LAST 1104    7122  0 0002 C           TC     Q
```

```
P0757                THE DOT PRODUCT SUBROUTINE USUALLY FORMS THE DOT PRODUCT OF THE VECTOR IN MPAC WITH A STANDARD SIX
R0759    REGISTER VECTOR WHOSE ADDRESS IS IN ADDRWD. IN THIS CASE C(DOTINC) ARE SET TO 2. VXM, HOWEVER, SETS C(DOTINC) TO
R0761    6 SO THAT DOTSUB DOTS MPAC WITH A COLUMN VECTOR OF THE MATRIX IN QUESTION IN THIS CASE.

0763    REF  52  LAST 1068    7123  3 4711 1  PREDOT  CAF    TWO       PROLOGUE TO SET DOTINC TO 2.
0764    REF   4  LAST   67    7124  54 136 1           TS     DOTINC

0765                          7125  0 0006 1  DOTSUB  EXTEND
0766    REF   5  LAST   67    7126  22 137 1           QXCH   DOTRET    SAVE RETURN.
0767    REF   1               7127  0 7056 C           TC     DMPSUB    DOT X COMPONENTS.
0768    REF 342  LAST 1104    7130  52 160 1           DXCH   MPAC +3   POSITION Y COMPONENT OF MPAC FOR
0769    REF 343  LAST 1105    7131  52 155 1           DXCH   MPAC      MULTIPLICATION WHILE SAVING RESULT IN
0770    REF  46  LAST 1100    7132  52 131 C           DXCH   BUF       THREE WORD BUFFER, BUF.
0771    REF 344  LAST 1105    7133  3 0156 C           CA     MPAC +2
0772    REF  47  LAST 1105    7134  54 132 C           TS     BUF +2

0773    REF   5  LAST 1105    7135  3 0136 C           CA     DOTINC    ADVANCE ADDRWD TO Y COMPONENT OF
0774    REF  52  LAST 1103    7136  26 116 C           ADS    ADDRWD    OTHER ARGUMENT.
0775    REF   2  LAST 1105    7137  0 7056 C           TC     DMPSUB
0776    REF 345  LAST 1105    7140  52 156 1           DXCH   MPAC +1   ACCUMULATE PARTIAL PRODUCTS.
0777    REF  48  LAST 1105    7141  20 132 C           DAS    BUF +1
0778    REF 346  LAST 1105    7142  6 0154 1           AD     MPAC
0779    REF  49  LAST 1105    7143  6 0130 C           AD     BUF
0780    REF  50  LAST 1105    7144  54 130 1           TS     BUF
0781                          7145  1 7147 C           TCF    +2
0782    REF   3  LAST 1104    7146  54 121 1           TS     OVFIND    IF OVERFLOW OCCURS.

0783    REF 347  LAST 1105    7147  52 162 C           DXCH   MPAC +5   MULTIPLY Z COMPONENTS.
0784    REF 348  LAST 1105    7150  52 155 1           DXCH   MPAC
0785    REF   6  LAST 1105    7151  3 0136 C           CA     DOTINC
0786    REF  53  LAST 1105    7152  26 116 C           ADS    ADDRWD
0787    REF   3  LAST 1105    7153  0 7056 C           TC     DMPSUB
0788    REF  51  LAST 1105    7154  52 132 C  ENDDOT   DXCH   BUF +1 Δ   LEAVE FINAL ACCUMULATION IN MPAC.
0789    REF 349  LAST 1105    7155  20 156 1           DAS    MPAC +1
0790    REF 350  LAST 1105    7156  6 0154 1           AD     MPAC
0791    REF  52  LAST 1105    7157  6 0130 C           AD     BUF
0792    REF 351  LAST 1105    7160  54 154 C           TS     MPAC
0793    REF   6  LAST 1105    7161  0 0137 1           TC     DOTRET

0794    REF   2  LAST 1099    7162  0 6766 C           TC     OVERFLOW  ON OVERFLOW HERE.
0795    REF   7  LAST 1105    7163  0 0137 1           TC     DOTRET
```

R0796 DOUBLE PRECISION POLYNOMIAL EVALUATOR

R0797
R0798 THIS ROUTINE EVALUATES $A_N X^N + A_{N-1} X^{N-1} + \ldots + A_1 X + A_0$ LEAVING THE DP RESULT IN MPAC ON EXIT.
R0800

R0801 THE ROUTINE HAS TWO ENTRIES

R0802 1. ENTRY THRU POWRSERS. THE COEFFICIENTS MAY BE EITHER IN FIXED OR ERASABLE, THE CALL IS BY
R0804 TC POWRSERS, AND THE RETURN IS TO LOC(TC POWRSERS)+1. THE ENTERING DATA MUST BE AS FOLLOWS

```
A0806                          A       SP      LOC-3           ADDRESS FOR REFERENCING COEF TABLE
A0807                          L       SP      N-1             N IS THE DEGREE OF THE POWER SERIES
A0808                          MPAC    DP      X               ARGUMENT

A0809                          LOC-2N  DP      A(0)
A0810                                  ...
A0811                          LOC     DP      A(N)
```

R0812 2. ENTRY THRU POLY. THE CALL TC POLY AND THE ENTERING DATA MUST BE AS FOLLOWS

```
A0814                          MPAC    DP      X               ARGUMENT

A0815                          LOC     TC      POLY
A0816                          LOC+1   SP      N-1
A0817                          LOC+2   DP      A(0)
A0818                                  ...
A0819                          LOC+2N+2 DP     A(N)            RETURN IS TO LOC+2N+4

 0820                   7164  0 0006 1 POWRSERS EXTEND
 0821  REF   1         7165  22 141 0         QXCH    POLYRET         RETURN ADDRESS
 0822  REF  16 LAST 1096 7166  54 117 1       TS      POLISH          POWER SERIES ADDRESS
 0823  REF   1         7167  22 140 1         LXCH    POLYCNT         N-1 TO COUNTER
 0824  REF   1         7170  1 7201 1         TCF     POLYCOM         SKIP SET UP BY POLY

 0825  REF 244 LAST 1104 7171  50 002 0 POLY  INDEX   Q
 0826                   7172  3 0000 1         CAF     0
 0827  REF   2 LAST 1106 7173  54 140 0       TS      POLYCNT         N-1 TO COUNTER
 0828                   7174  6 0000 1         DOUBLE
 0829  REF 245 LAST 1106 7175  6 0002 0       AD      Q
 0830  REF  17 LAST 1106 7176  54 117 1       TS      POLISH          L(A(N))-3 TO POLISH
 0831  REF  26 LAST 1100 7177  6 4715 0       AD      FIVE
 0832  REF   2 LAST 1106 7200  54 141 1       TS      POLYRET         STORE RETURN ADDRESS

 0833  REF   1         7201  3 6242 0 POLYCOM CAF     LVBUF           INCOMING X WILL BE MOVED TO VBUF, SO
 0834  REF  54 LAST 1105 7202  54 116 0       TS      ADDRWD          SET ADDRWD SO DMPSUB WILL MPY BY VBUF.

 0835                   7203  0 0006 1         EXTEND
 0836  REF  18 LAST 1106 7204  5 0117 0       INDEX   POLISH
 0837                   7205  3 0004 0         DCA     3
```

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```
0838   REF 352  LAST 1105    7206  52 155 1            DXCH   MPAC      LOAD A(N) INTO MPAC,
0839   REF  23  LAST 1082    7207  52 123 C            DXCH   VBUF      SAVING X IN VBUF
0840   REF   1               7210  1 7214 0            TCF    POLY2

0841   REF   3  LAST 1106    7211  54 140 C  POLYLOOP  TS     POLYCNT   SAVE DECREMENTED LOOP COUNTER
0842   REF  53  LAST 1105    7212  4 4711 C            CS     TWO
0843   REF  19  LAST 1106    7213  26 117 1            ADS    POLISH    REGRESS COEFFICIENT POINTER

0844   REF   4  LAST 1105    7214  0 7056 C  POLY2     TC     DMPSUB    MULTIPLY BY X
0845                         7215  0 0006 1            EXTEND
0846   REF  20  LAST 1107    7216  5 0117 C            INDEX  POLISH
0847                         7217  3 0002 0            DCA    1          ADD IN NEXT COEFFICIENT
0848   REF 353  LAST 1107    7220  20 155 1            DAS    MPAC      USERS RESPONSIBILITY TO ASSURE NO OVFLOW

0849   REF   4  LAST 1107    7221  10 140 0            CCS    POLYCNT
0850   REF   1               7222  1 7211 C            TCF    POLYLOOP
0851   REF   3  LAST 1106    7223  0 0141 0            TC     POLYRET   RETURN CALLER
```

```
PC852           MISCELLANEOUS MULTI-PRECISION ROUTINES REQUIRED IN FIXED-FIXED BUT NOT USED BY THE INTERPRETER.

 085358 REF 210  LAST 1104   7224  3 4714 1  DPAGREE  CAF   ZERO      DOUBLE PRECISION ENTRY -
 085359 REF 354  LAST 1107   7225  54 156 1           TS    MPAC +2   ZERO LOW-ORDER WORD

 0854   REF 246  LAST 1106   7226  22 002 C  TPAGREE  LXCH  Q         FORCE SIGN AGREEMENT AMONG THE TRIPLE
 0855   REF   1              7227  0 6672 1           TC    BRANCH    PRECISION CONTENTS OF MPAC.  RETURNING
 0856   REF   1              7230  1 7234 1           TCF   ARG+       WITH SIGNUM OF THE INPUT IN A.
 0857   REF   1              7231  1 7254 1           TCF   ARGZERO

 0858   REF  28  LAST 1040   7232  4 4672 1           CS    POSMAX    IF NEGATIVE.
 0859                        7233  1 7235 C           TCF   +2

 0860   REF  29  LAST 1108   7234  3 4672 C  ARG+     CAF   POSMAX
 0861   REF 247  LAST 1108   7235  54 002 1           TS    Q
 0862                        7236  0 0006 1           EXTEND
 0863   REF 291  LAST 110C   7237  24 000 1           AUG   A         FORMS +-1.0.
 0864   REF 355  LAST 1108   7240  6 0156 C           AD    MPAC +2
 0865   REF 356  LAST 1108   7241  54 156 1           TS    MPAC +2
 0866   REF 211  LAST 1108   7242  3 4714 1           CAF   ZERO
 0867   REF 248  LAST 1108   7243  6 0002 C           AD    Q
 0868   REF 357  LAST 1108   7244  6 0155 C           AD    MPAC +1
 0869   REF 358  LAST 1108   7245  54 155 1           TS    MPAC +1
 0870   REF 212  LAST 1108   7246  3 4714 1           CAF   ZERO
 0871   REF 249  LAST 1108   7247  6 0002 C           AD    Q         Q STILL HAS POSMAX OR NEGMAX IN IT.
 0872   REF 359  LAST 1108   7250  6 0154 1           AD    MPAC
 0873   REF 360  LAST 1108   7251  54 154 C  ARGZERO2 TS    MPAC      ALWAYS SKIPPING UNLESS ARGZERO.
 0874   REF 361  LAST 1108   7252  54 155 1           TS    MPAC +1
 0875   REF 172  LAST 1104   7253  0 0001 C           TC    L         RETURN VIA L.

 0876   REF 362  LAST 1108   7254  54 156 1  ARGZERO  TS    MPAC +2   SET ALL THREE MPAC REGISTERS TO ZERO.
 0877   REF   1              7255  1 7251 1           TCF   ARGZERO2

RC878           SHORTMP MULTIPLIES THE TP CONTENTS OF MPAC BY THE SINGLE PRECISION NUMBER ARRIVING IN A.

 0880   REF  12  LAST 1103   7256  54 135 1  SHORTMP  TS    MPTEMP
 0881                        7257  0 0006 1           EXTEND
 0882   REF 363  LAST 1108   7260  7 0156 1           MP    MPAC +2
 0883   REF 364  LAST 1108   7261  54 156 1           TS    MPAC +2
 0884   REF 213  LAST 1108   7262  3 4714 1  SHORTMP2 CAF   ZERO      SO SUBSEQUENT DAS WILL WORK.
 0885   REF 365  LAST 1108   7263  56 155 C           XCH   MPAC +1
 0886   REF   1              7264  1 7075 C           TCF   DMPSLB2
```

```
P0887          DMPNSUB MULTIPLIES THE DP FRACTION ARRIVING IN MPAC BY THE SP
R0888    INTEGER ARRIVING IN A.  THE DP PRODUCT DEPARTS BOTH IN MPAC AND IN
R0889    A AND L.  NOTE THAT DMPNSUB NORMALLY INCREASES THE MAGNITUDE OF THE
R0890    CONTENTS OF MPAC.  THE CUSTOMER MUST INSURE THAT B(A) X B(MPAC,MPAC+1)
R0891    AND B(A) X B(MPAC) ARE LESS THAN 1 IN MAGNITUDE, WHERE B, AS IS OBVIOUS,
R0892    INDICATES THE ARRIVING CONTENTS.

 0893   REF   1                 7265  54 135 1  DMPNSUB  TS      DMPNTEMP
 0894                          7266  0 0006 1           EXTEND
 0895   REF 366  LAST 1108     7267  7 0155 1           MP      MPAC +1
 0896   REF 367  LAST 1109     7270  52 155 1           DXCH    MPAC            LOW PRODUCT TO MPAC, HIGH FACTOR TO A
 0897                          7271  0 0006 1           EXTEND
 0898   REF   2  LAST 1109     7272  7 0135 1           MP      DMPNTEMP
 0899   REF 173  LAST 1108     7273  3 0001 0           CA      L
 0900   REF 368  LAST 1109     7274  26 154 0           ADS     MPAC            COMPLETING THE PRODUCT IN MPAC
 0901                          7275  0 0006 1           EXTEND
 0902   REF 369  LAST 1109     7276  3 0155 0           DCA     MPAC            BRINGING THE PRODUCT INTO A AND L
 0903   REF 25C  LAST 1108     7277  0 0002 0           TC      Q
```

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P0904 MISCELLANEOUS VECTOR OPERATIONS. INCLUDED HERE ARE THE FOLLOWING:

R0905 1. DOT DP VECTOR DOT PRODUCT.
R0906 2. VXV DP VECTOR CROSS PRODUCT.
R0907 3. VXSC DP VECTOR TIMES SCALAR.
R0908 4. V/SC DP VECTOR DIVIDED BY SCALAR.
R0909 5. VPROJ DP VECTOR PROJECTION. ((MPAC.X)MPAC).
R0910 6. VXM DP VECTOR POST-MULTIPLIED BY MATRIX.
R0911 7. MXV DP VECTOR PRE-MULTIPLIED BY MATRIX.

```
0912  REF   1                7300  0 7123 C  DOT     TC    PREDCT    DO THE DOT PRODUCT AND EXIT, CHANGING
0913  REF 214  LAST 1108     7301  3 4714 1  DMODE   CAF   ZERO      THE MODE TO DP SCALAR.
0914  REF   3  LAST 1091     7302  1 6027 C           TCF   NEWMODE

0915  REF  54  LAST 1107     7303  3 4711 1  MXV     CAF   TWO       SET UP MATINC AND DOTINC FOR ROW
0916  REF   5  LAST   67     7304  54 140 C           TS    MATINC    VECTORS.
0917  REF   1                7305  1 7311 1           TCF   VXM/MXV   GO TO COMMON PORTION.

0918  REF   9  LAST 1037     7306  4 4377 1  VXM     CS    TEN       SET MATINC AND DOTINC TO REFER TO MATRIX
0919  REF   6  LAST 111C     7307  54 140 C           TS    MATINC    AS THREE COLUMN VECTORS.
0920  REF  35  LAST 1025     7310  3 6211 C           CAF   SIX
```

```
P0921            COMMON PORTION OF MXV AND VXM.

 0922  REF   7  LAST 1105     7311  54 136 1  VXM/MXV  TS      DOTINC
R0923            ITRACE (2) REFERS TO "VXM/MXV".
 0924  REF   1                7312  0 7501 1           TC      MPACVBUF        SAVE VECTOR IN MPAC FOR FURTHER USE.

 0925  REF   1                7313  0 7125 0           TC      DOTSUB          GO DOT TO GET X COMPONENT OF ANSWER.
 0926                         7314  0 0006 1           EXTEND
 0927  REF  24  LAST 1107     7315  3 0123 1           DCA     VBUF            MOVE MPAC VECTOR BACK INTO MPAC, SAVING
 0928  REF 370  LAST 1109     7316  52 155 1           DXCH    MPAC            NEW X COMPONENT IN BUF2.
 0929  REF  11  LAST 1071     7317  52 134 0           DXCH    BUF2
 0930                         7320  0 0006 1           EXTEND
 0931  REF  25  LAST 1111     7321  3 0125 1           DCA     VBUF +2
 0932  REF 371  LAST 1111     7322  52 160 1           DXCH    MPAC +3
 0933                         7323  0 0006 1           EXTEND
 0934  REF  26  LAST 1111     7324  3 0127 0           DCA     VBUF +4
 0935  REF 372  LAST 1111     7325  52 162 0           DXCH    MPAC +5
 0936  REF   7  LAST 1110     7326  3 0140 1           CA      MATINC          INITIALIZE ADDRWD FOR NEXT DOT PRODUCT.
 0937  REF  55  LAST 1106     7327  26 116 0           ADS     ADDRWD          FORMS BASE ADDRESS OF NEXT COLUMN(ROW).

 0938  REF   2  LAST 1111     7330  0 7125 0           TC      DOTSUB
 0939  REF  27  LAST 1111     7331  52 123 0           DXCH    VBUF            MOVE GIVEN VECTOR BACK TO MPAC, SAVING Y
 0940  REF 373  LAST 1111     7332  52 155 1           DXCH    MPAC            COMPONENT OF ANSWER IN VBUF +2.
 0941  REF  28  LAST 1111     7333  52 125 0           DXCH    VBUF +2
 0942  REF 374  LAST 1111     7334  52 160 1           DXCH    MPAC +3
 0943  REF  29  LAST 1111     7335  52 127 1           DXCH    VBUF +4
 0944  REF 375  LAST 1111     7336  52 162 0           DXCH    MPAC +5
 0945  REF   8  LAST 1111     7337  3 0140 1           CA      MATINC          FORM ADDRESS OF LAST COLUMN OR ROW.
 0946  REF  56  LAST 1111     7340  26 116 0           ADS     ADDRWD

 0947  REF   3  LAST 1111     7341  0 7125 0           TC      DOTSUB
 0948  REF  12  LAST 1111     7342  52 134 0           DXCH    BUF2            ANSWER NOW COMPLETE. PUT COMPONENTS INTO
 0949  REF 376  LAST 1111     7343  52 155 1           DXCH    MPAC            PROPER MPAC REGISTERS.
 0950  REF 377  LAST 1111     7344  52 162 0           DXCH    MPAC +5
 0951  REF  30  LAST 1111     7345  52 125 0           DXCH    VBUF +2
 0952  REF 378  LAST 1111     7346  52 160 1           DXCH    MPAC +3
 0953  REF  20  LAST 1102     7347  1 6030 0           TCF     DANZIG          EXIT.
```

P0954 VXSC - VECTOR TIMES SCALAR.

```
0955   REF  16  LAST 1104    7350  10 163 1  VXSC      CCS     MODE      TEST PRESENT MODE.
0956   REF   1               7351   1 7377 1            TCF     DVXSC     SEPARATE ROUTINE WHEN SCALAR IS IN MPAC.
0957   REF   2  LAST 1112    7352   1 7377 1            TCF     DVXSC

0958   REF   5  LAST 1107    7353   0 7056 C  VVXSC     TC      DMPSUB    COMPUTE X COMPONENT
0959   REF   1               7354   0 7107 C            TC      VROUND    AND ROUND IT.
0960   REF 379  LAST 1111    7355  52 160 1            DXCH    MPAC +3   PUT Y COMPONENT INTO MPAC SAVING MPAC IN
0961   REF 380  LAST 1112    7356  52 155 1            DXCH    MPAC      MPAC +3.
0962   REF 381  LAST 1112    7357  52 160 1            DXCH    MPAC +3

0963   REF   6  LAST 1112    7360   0 7056 C            TC      DMPSUB    DO SAME FOR Y AND Z COMPONENTS.
0964   REF   2  LAST 1112    7361   0 7107 C            TC      VROUND
0965   REF 382  LAST 1112    7362  52 162 0            DXCH    MPAC +5
0966   REF 383  LAST 1112    7363  52 155 1            DXCH    MPAC
0967   REF 384  LAST 1112    7364  52 162 0            DXCH    MPAC +5

0968   REF   7  LAST 1112    7365   0 7056 C            TC      DMPSUB
0969   REF   3  LAST 1112    7366   0 7107 C            TC      VROUND
0970   REF 385  LAST 1112    7367  52 155 1  VROTATEX   DXCH    MPAC      EXIT USED TC RESTORE MPAC AFTER THIS
0971   REF 386  LAST 1112    7370  52 162 0            DXCH    MPAC +5   TYPE OF ROTATION. CALLED BY VECTOR SHIFT
0972   REF 387  LAST 1112    7371  52 160 1            DXCH    MPAC +3   RIGHT, V/SC, ETC.
0973   REF 388  LAST 1112    7372  52 155 1            DXCH    MPAC

0974   REF  21  LAST 1111    7373   1 6030 C            TCF     DANZIG
```

R0975 DF VECTOR PROJECTION ROUTINE.

```
0976  REF   2  LAST 1110   7374  0 7123 0  VPROJ   TC     PREDOT    (MPAC.X)MPAC IS COMPUTED AND LEFT IN
0977  REF  15  LAST 1027   7375  4 4710 1          CS     FOUR      MPAC. DO DOT AND FALL INTO DVXSC.
0978  REF  57  LAST 1111   7376 26 116 0          ADS    ADDRWD

R0979          VXSC WHEN SCALAR ARRIVES IN MPAC AND VECTOR IS AT X.

0980                        7377  0 0006 1  DVXSC  EXTEND            SAVE SCALAR IN MPAC +3 AND GET X
0981  REF 389  LAST 1112   7400  3 0155 0          DCA    MPAC      COMPONENT OF ANSWER.
0982  REF 390  LAST 1113   7401 52 160 1          DXCH   MPAC +3
0983  REF   8  LAST 1112   7402  0 7056 0          TC     DMPSUB
0984  REF   4  LAST 1112   7403  0 7107 0          TC     VROUND

0985  REF  55  LAST 1110   7404  3 4711 1          CAF    TWO       ADVANCE ADDRWD TO Y COMPONENT OF X.
0986  REF  58  LAST 1113   7405 26 116 0          ADS    ADDRWD
0987                        7406  0 0006 1          EXTEND
0988  REF 391  LAST 1113   7407  3 0160 0          DCA    MPAC +3   PUT SCALAR BACK INTO MPAC AND SAVE
0989  REF 392  LAST 1113   7410 52 155 1          DXCH   MPAC      X RESULT IN MPAC +5.
0990  REF 393  LAST 1113   7411 52 162 0          DXCH   MPAC +5
0991  REF   9  LAST 1113   7412  0 7056 0          TC     DMPSUB
0992  REF   5  LAST 1113   7413  0 7107 0          TC     VROUND

0993  REF  56  LAST 1113   7414  3 4711 1          CAF    TWO
0994  REF  59  LAST 1113   7415 26 116 0          ADS    ADDRWD    TO Z COMPONENT.
0995  REF 394  LAST 1113   7416 52 160 1          DXCH   MPAC +3   BRING SCALAR BACK, PUTTING Y RESULT IN
0996  REF 395  LAST 1113   7417 52 155 1          DXCH   MPAC      THE PROPER PLACE.
0997  REF 396  LAST 1113   7420 52 160 1          DXCH   MPAC +3
0998  REF  10  LAST 1113   7421  0 7056 0          TC     DMPSUB
0999  REF   6  LAST 1113   7422  0 7107 0          TC     VROUND

1000  REF 397  LAST 1113   7423 52 155 1          DXCH   MPAC      PUT Z COMPONENT IN PROPER PLACE, ALSO
1001  REF 398  LAST 1113   7424 52 162 0          DXCH   MPAC +5   POSITIONING X.
1002  REF 399  LAST 1113   7425 52 155 1          DXCH   MPAC

1003  REF   1               7426  1 6470 0          TCF    VMODE     MODE HAS CHANGED TO VECTOR.
```

P1004 THE VECTOR CROSS PRODUCT ROUTINE CALCULATES (X M -X M ,X M -X M ,X M -X M) WHERE M IS THE VECTOR IN
R1006 3 2 2 3 1 3 3 1 2 1 1 2
R1008 MPAC AND X THE VECTOR AT THE GIVEN ADDRESS.

```
1009                          7427  0 0006 1  VXV     EXTEND
1010  REF 400  LAST 1113      7430  3 0162 1          DCA     MPAC +5          FORM UP M3X1, LEAVING M1 IN VBUF.
1011  REF 401  LAST 1114      7431  52 155 1          DXCH    MPAC
1012  REF  31  LAST 1111      7432  52 123 0          DXCH    VBUF
1013  REF  11  LAST 1113      7433  0 7056 0          TC      DMPSUB           BY X1.

1014                          7434  0 0006 1          EXTEND
1015  REF 402  LAST 1114      7435  4 0160 1          DCS     MPAC +3          CALCULATE -X1M2, SAVING X1M3 IN VBUF +2.
1016  REF 403  LAST 1114      7436  52 155 1          DXCH    MPAC
1017  REF  32  LAST 1114      7437  52 125 0          DXCH    VBUF +2
1018  REF  12  LAST 1114      7440  0 7056 0          TC      DMPSUB

1019  REF  57  LAST 1113      7441  3 4711 1          CAF     TWO              ADVANCE ADDRWD TO X2.
1020  REF  60  LAST 1113      7442  26 116 0          ADS     ADDRWD
1021                          7443  0 0006 1          EXTEND
1022  REF 404  LAST 1114      7444  4 0162 0          DCS     MPAC +5          PREPARE TO GET -X2M3, SAVING -X1M2 IN
1023  REF 405  LAST 1114      7445  52 155 1          DXCH    MPAC             MPAC +5.
1024  REF 406  LAST 1114      7446  52 162 0          DXCH    MPAC +5
1025  REF  13  LAST 1114      7447  0 7056 0          TC      DMPSUB

1026                          7450  0 0006 1          EXTEND
1027  REF  33  LAST 1114      7451  3 0123 1          DCA     VBUF             GET X2M1, SAVING -X2M3 IN VBUF +4.
1028  REF 407  LAST 1114      7452  52 155 1          DXCH    MPAC
1029  REF  34  LAST 1114      7453  52 127 1          DXCH    VBUF +4
1030  REF  14  LAST 1114      7454  0 7056 0          TC      DMPSUB

1031  REF  58  LAST 1114      7455  3 4711 1          CAF     TWO              ADVANCE ADDRWD TO X3.
1032  REF  61  LAST 1114      7456  26 116 0          ADS     ADDRWD
1033                          7457  0 0006 1          EXTEND
1034  REF  35  LAST 1114      7460  4 0123 0          DCS     VBUF             GET -X3M1, ADDING X2M1 TO MPAC +5 TO
1035  REF 408  LAST 1114      7461  52 155 1          DXCH    MPAC             COMPLETE THE Z COMPONENT OF THE ANSWER.
1036  REF 409  LAST 1114      7462  20 162 0          DAS     MPAC +5

1037                          7463  0 0006 1          EXTEND
1038                          7464  1 7466 0          BZF     +2
1039  REF   3  LAST 1100      7465  0 6760 0          TC      OVERFLWZ

1040  REF  15  LAST 1114      7466  0 7056 0          TC      DMPSUB
1041  REF  36  LAST 1114      7467  52 125 0          DXCH    VBUF +2          MOVE X1M3 TO MPAC +3 SETTING UP FOR X3M2
1042  REF 410  LAST 1114      7470  52 160 1          DXCH    MPAC +3          AND ADD -X3M1 TO MPAC +3 TO COMPLETE THE
1043  REF 411  LAST 1114      7471  52 155 1          DXCH    MPAC             Y COMPONENT OF THE RESULT.
1044  REF 412  LAST 1114      7472  20 160 1          DAS     MPAC +3

1045                          7473  0 0006 1          EXTEND
1046                          7474  1 7476 1          BZF     +2
```

```
1047   REF   3  LAST 1100    7475  0 6763 C          TC     OVERFLWY

1048   REF  16  LAST 1114    7476  0 7056 C          TC     DMPSUB
1049   REF  37  LAST 1114    7477  52 127 1          DXCH   VBUF +4          GO ADD -X2M3 TO X3M2 TO COMPLETE THE X
1050   REF   4  LAST 1101    7500  1 6747 1          TCF    ENDVXV           COMPONENT (TAIL END OF DAD).

R1051          THE MPACVBUF SUBROUTINE SAVES THE VECTOR IN MPAC IN VBUF WITHOUT CLOBBERING MPAC.

1053                          7501  0 0006 1  MPACVBUF EXTEND                CALLED BY MXV, VXM, AND UNIT.
1054   REF 413  LAST 1114    7502  3 0155 C          DCA    MPAC
1055   REF  38  LAST 1115    7503  52 123 C          DXCH   VBUF
1056                          7504  0 0006 1          EXTEND
1057   REF 414  LAST 1115    7505  3 0160 C          DCA    MPAC +3
1058   REF  39  LAST 1115    7506  52 125 C          DXCH   VBUF +2
1059                          7507  0 0006 1          EXTEND
1060   REF 415  LAST 1115    7510  3 0162 1          DCA    MPAC +5
1061   REF  40  LAST 1115    7511  52 127 1          DXCH   VBUF +4
1062   REF 251  LAST 1109    7512  0 0002 C          TC     Q                RETURN TO CALLER.

R1063          DOUBLE PRECISION SIGN AGREE ROUTINE. ARRIVE WITH INPUT IN A+L. OUTPUT IS IN A + L.

1065   REF 292  LAST 1108    7513  10 000 C  ALSIGNAG CCS    A                TEST UPPER PART.
1066   REF   1               7514  1 7520 C          TCF    UPPOS            IT IS POSITIVE
1067   REF 252  LAST 1115    7515  0 0002 C          TC     Q                ZERO
1068   REF   1               7516  1 7530 1          TCF    UPNEG            NEGATIVE
1069   REF 293  LAST 1115    7517  0 0002 C          TC     Q                ZERO

1070   REF 174  LAST 1109    7520  56 001 C  UPPOS    XCH    L                SAVE DECREMENTED UPPER PART.
1071   REF   9  LAST 1059    7521  6 4675 1          AD     HALF
1072   REF  10  LAST 1115    7522  6 4675 1          AD     HALF
1073   REF 293  LAST 1115    7523  54 000 C          TS     A                SKIPS ON OVERFLOW
1074                          7524  1 7526 C          TCF    +2
1075   REF 175  LAST 1115    7525  24 001 C          INCR   L                RESTORE UPPER TO ORIGINAL VALUE
1076   REF 176  LAST 1115    7526  56 001 C          XCH    L                SWAP A + L BACK.
1077   REF 254  LAST 1115    7527  0 0002 C          TC     Q

1078   REF 177  LAST 1115    7530  56 001 C  UPNEG    XCH    L                SAVE COMPLEMENTED + DECREMENTED UPPER PT
1079   REF  11  LAST 1030    7531  6 4674 C          AD     NEGMAX
1080   REF  24  LAST 1086    7532  6 7716 C          AD     NEGONE
1081   REF 294  LAST 1115    7533  54 000 C          TS     A
1082                          7534  1 7536 1          TCF    +2               DONT INCREMENT IF NO OVERFLOW.
1083   REF 178  LAST 1115    7535  24 001 C          INCR   L
1084   REF 179  LAST 1115    7536  56 001 C          XCH    L
1085                          7537  4 0000 C          COM                     MAKE NEGATIVE AGAIN.
1086   REF 255  LAST 1115    7540  0 0002 C          TC     Q
```

P1087 INTERPRETIVE INSTRUCTIONS WHOSE EXECUTION CONSISTS OF PRINCIPALLY CALLING SUBROUTINES.

```
1089  REF  17  LAST 1115   7541  0 7056 C  DMP1   TC     DMPSUB          DMP INSTRUCTION.
1090  REF  22  LAST 1112   7542  1 6030 C         TCF    DANZIG

1091  REF  18  LAST 1116   7543  0 7056 C  DMPR   TC     DMPSUB
1092  REF   1              7544  0 7106 1         TC     ROUNDSUB +1     (C(A) = +0).
1093  REF  23  LAST 1116   7545  1 6030 C         TCF    DANZIG

1094                       7546  0 0006 1  DDV    EXTEND
1095  REF  62  LAST 1114   7547  5 0116 1         INDEX  ADDRWD          MOVE DIVIDEND INTO BUF.
1096                       7550  3 0001 C         DCA    0
1097  REF   2  LAST 1083   7551  1 7556 1         TCF    BDDV +4

1098                       7552  0 0006 1  BDDV   EXTEND                 MOVE DIVISOR INTO MPAC SAVING MPAC, THE
1099  REF  63  LAST 1116   7553  5 0116 1         INDEX  ADDRWD          DIVIDEND, IN BUF.
1100                       7554  3 0001 C         DCA    0
1101  REF 416  LAST 1115   7555  52 155 1         DXCH   MPAC
1102  REF  53  LAST 1105   7556  52 131 C  +4     DXCH   BUF
1103  REF 215  LAST 1110   7557  3 4714 1         CAF    ZERO            DIVIDE ROUTINES IN BANK 0.
1104  REF  20  LAST 1096   7560  54 004 1         TS     FBANK
1105  REF   1              7561  1 2353 1         TCF    DDV/BDDV

1106  REF  64  LAST 1116   7562  3 0116 1  SETPD  CA     ADDRWD          MUST SET TO WORK AREA, OR EBANK TROUBLE.
1107  REF  12  LAST 1093   7563  54 166 1         TS     PUSHLOC
1108  REF   1              7564  1 6032 1         TCF    NOIBNKSW        NO FBANK SWITCH REQUIRED.

1109  REF 216  LAST 1116   7565  3 4714 1  TSLC   CAF    ZERO            SHIFTING ROUTINES LOCATED IN BANK 00.
1110  REF  21  LAST 1116   7566  54 004 1         TS     FBANK
1111  REF   1              7567  1 2172 C         TCF    TSLC2

1112  REF   7  LAST 1075   7570  3 6043 C  GSHIFT  CAF    LOW7            USED AS MASK AT GENSHIFT. THIS PROCESSES
1113  REF  22  LAST 1116   7571  54 004 1         TS     FBANK           ANY SHIFT INSTRUCTION (EXCEPT TSLC) WITH
1114  REF   1              7572  1 2214 C         TCF    GENSHIFT        AN ADDRESS (ROUTINES IN BANK 0).
```

P1115 THE FOLLOWING IS THE PROLOGUE TO V/SC. IF THE PRESENT MODE IS VECTOR, IT SAVES THE SCALAR AT X IN BUF
R1117 AND CALLS THE V/SC ROUTINE IN BANK 0. IF THE PRESENT MODE IS SCALAR, IT MOVES THE VECTOR AT X INTO MPAC, SAVING
R1119 THE SCALAR IN MPAC IN BUF BEFORE CALLING THE V/SC ROUTINE IN BANK 0.

```
1120  REF  17  LAST 1112     7573  10 163 1  V/SC    CCS    MODE
1121  REF   1               7574  1 7605 1           TCF    DV/SC          MOVE VECTOR INTO MPAC.
1122  REF   2  LAST 1117     7575  1 7605 1           TCF    DV/SC

1123                          7576  0 0006 1  VV/SC   EXTEND
1124  REF  65  LAST 1116     7577  5 0116 1           INDEX  ADDRWD
1125                          7600  3 0001 0           DCA    0
1126  REF  54  LAST 1116     7601  52 131 C  V/SC1    DXCH   BUF             IN BOTH CASES, VECTOR IS NOW IN MPAC AND
1127  REF 217  LAST 1116     7602  3 4714 1           CAF    ZERO            SCALAR IN BUF.
1128  REF  23  LAST 1116     7603  54 004 1           TS     FBANK
1129  REF   1               7604  1 2654 0           TCF    V/SC2

1130                          7605  0 0006 1  DV/SC    EXTEND
1131  REF  66  LAST 1117     7606  5 0116 1           INDEX  ADDRWD
1132                          7607  3 0003 1           DCA    2
1133  REF 417  LAST 1116     7610  52 160 1           DXCH   MPAC +3
1134                          7611  0 0006 1           EXTEND
1135  REF  67  LAST 1117     7612  5 0116 1           INDEX  ADDRWD
1136                          7613  3 0005 1           DCA    4
1137  REF 418  LAST 1117     7614  52 162 C           DXCH   MPAC +5

1138  REF 135  LAST 1091     7615  4 4712 C           CS     ONE             CHANGE MODE TO VECTOR.
1139  REF  18  LAST 1117     7616  54 163 1           TS     MODE

1140                          7617  0 0006 1           EXTEND
1141  REF  68  LAST 1117     7620  5 0116 1           INDEX  ADDRWD
1142                          7621  3 0001 C           DCA    0
1143  REF 419  LAST 1117     7622  52 159 1           DXCH   MPAC
1144  REF   1               7623  1 7601 0           TCF    V/SC1           FINISH PROLOGUE AT COMMON SECTION.
```

P1145 SIGN AND COMPLEMENT INSTRUCTIONS.

```
1146  REF  69  LAST 1117   7624  50 116 1  SIGN   INDEX  ADDRWD   CALL COMP INSTRUCTION IF WORD AT X IS
1147                       7625  10 000 0          CCS    0        NEGATIVE NON-ZERO.
1148  REF  24  LAST 1116   7626  1 6030 C          TCF    DANZIG
1149                       7627  1 7631 C          TCF    +2
1150  REF   2  LAST 1085   7630  1 7637 C          TCF    COMP     DO THE COMPLEMENT.

1151  REF  70  LAST 1118   7631  50 116 1          INDEX  ADDRWD
1152                       7632  10 001 1  CCSL     CCS    1
1153  REF  25  LAST 1118   7633  1 6030 C          TCF    DANZIG
1154  REF  26  LAST 1118   7634  1 6030 C          TCF    DANZIG
1155  REF   3  LAST 1118   7635  1 7637 C          TCF    COMP
1156  REF  27  LAST 1118   7636  1 6030 C          TCF    DANZIG
1157                       7637  0 0006 1  COMP     EXTEND          COMPLEMENT DP MPAC IN EVERY CASE.
1158  REF 420  LAST 1117   7640  4 0155 1          DCS    MPAC
1159  REF 421  LAST 1118   7641  52 155 1          DXCH   MPAC

1160  REF  19  LAST 1117   7642  10 163 1          CCS    MODE     EITHER COMPLEMENT MPAC +3 OR THE REST OF
1161  REF   1              7643  1 7654 C          TCF    DCOMP    THE VECTOR ACCUMULATOR.
1162  REF   2  LAST 1118   7644  1 7654 C          TCF    DCOMP

1163                       7645  0 0006 1          EXTEND          VECTOR COMPLEMENT.
1164  REF 422  LAST 1118   7646  4 0160 1          DCS    MPAC +3
1165  REF 423  LAST 1118   7647  52 160 1          DXCH   MPAC +3
1166                       7650  0 0006 1          EXTEND
1167  REF 424  LAST 1118   7651  4 0162 C          DCS    MPAC +5
1168  REF 425  LAST 1118   7652  52 162 C          DXCH   MPAC +5
1169  REF  28  LAST 1118   7653  1 6030 C          TCF    DANZIG

1170  REF 426  LAST 1118   7654  4 0156 1  DCOMP    CS     MPAC +2
1171  REF 427  LAST 1118   7655  54 156 1          TS     MPAC +2
1172  REF  29  LAST 1118   7656  1 6030 C          TCF    DANZIG
```

P1173 THE FOLLOWING SHORT SHIFT CODES REQUIRE NO ADDRESS WORD:

R1174 1. SR1 TO SR4 SCALAR SHIFT RIGHT.
R1175 2. SR1R TO SR4R SCALAR SHIFT RIGHT AND ROUND.
R1176 3. SL1 TO SL4 SCALAR SHIFT LEFT.
R1177 4. SL1R TO SL4R SCALAR SHIFT LEFT AND ROUND.

R1178 5. VSR1 TO VSR8 VECTOR SHIFT RIGHT (ALWAYS ROUNDS).
R1179 6. VSL1 TO VSL8 VECTOR SHIFT LEFT (NEVER ROUNDS).

R1180 THE FOLLOWING CODES REQUIRE AN ADDRESS WHICH MAY BE INDEXED:*

R1181 1. SR SCALAR SHIFT RIGHT.
R1182 2. SRR SCALAR SHIFT RIGHT AND ROUND.
R1183 3. SL SCALAR SHIFT LEFT.
R1184 4. SLR SCALAR SHIFT LEFT AND ROUND.

R1185 5. VSR VECTOR SHIFT RIGHT.
R1186 6. VSL VECTOR SHIFT LEFT.

R1187 * IF THE ADDRESS IS INDEXED, AND THE INDEX MODIFICATION RESULTS IN A NEGATIVE SHIFT COUNT, A SHIFT OF THE
R1189 ABSOLUTE VALUE OF THE COUNT IS DONE IN THE OPPOSITE DIRECTION.

```
1190                          CO,2017                    BANK    00

1191  REF   2 LAST 1085 TC 1086:    15    154           COUNT   00/INTER

1192  REF  36 LAST 1110  00,2017  3 6211 0  SHORTT  CAF    SIX     SCALAR SHORT SHIFTS COME HERE. THE SHIFT
1193  REF  29 LAST 1090  00,2020  7 0020 1           MASK   CYR     COUNT-1 IS NOW IN BITS 2-3 OF CYR. THE
1194  REF  20 LAST 1058  00,2021  54 021 0           TS     SR      ROUNDING BIT IS IN BIT1 AT THIS POINT.

1195  REF  30 LAST 1119  00,2022  10 020 1           CCS    CYR     SEE IF RIGHT OR LEFT SHIFT DESIRED.
1196  REF   1            00,2023  1 2101 1           TCF    TSSL    SHIFT LEFT.

1197                     00,2024   00024 1  SRDDV    DEC    20      MPTEMP SETTING FOR SR BEFORE DDV.

1198  REF  21 LAST 1119  00,2025  50 021 1  TSSR     INDEX  SR      GET SHIFTING BIT.
1199  REF  63 LAST 1007  00,2026  3 4675 1           CAF    BIT14
1200  REF  13 LAST 1108  00,2027  54 135 1           TS     MPTEMP

1201  REF  31 LAST 1119  00,2030  10 020 1           CCS    CYR     SEE IF A ROUND IS DESIRED.
1202  REF   1            00,2031  0 2050 0  RIGHTR   TC     MPACSRND YES - SHIFT RIGHT AND ROUND.
1203  REF   4 LAST 1110  00,2032  1 6027 0           TCF    NEWMODE SET MODE TO DP (C(A) = 0).
1204  REF  14 LAST 1119  00,2033  3 0135 0  MPACSHR  CA     MPTEMP  DO A TRIPLE PRECISION SHIFT RIGHT.
1205                     00,2034  0 0006 1           EXTEND
1206  REF 428 LAST 1118  00,2035  7 0156 1           MP     MPAC +2
1207  REF 429 LAST 1119  00,2036  54 156 1    +3     TS     MPAC +2 (EXIT FROM SQRT AND ABVAL).
1208  REF  15 LAST 1119  00,2037  3 0135 0           CA     MPTEMP
1209                     00,2040  0 0006 1           EXTEND
```

```
1210  REF 430  LAST 1119  CO,2041  7 0154 C          MP      MPAC        SHIFT MAJOR PART INTO A,L AND PLACE IN
1211  REF 431  LAST 112C  CO,2042  52 155 1          DXCH    MPAC        MPAC,+1.
1212  REF  16  LAST 1119  CO,2043  3 0135 C          CA      MPTEMP
1213                       CO,2044  0 0006 1          EXTEND
1214  REF 180  LAST 1119  CO,2045  7 0001 1          MP      L           ORIGINAL C(MPAC +1).
1215  REF 432  LAST 112C  CO,2046  20 156 1          DAS     MPAC +1     GUARANTEED NO OVERFLOW.
1216  REF  30  LAST 1118  CO,2047  1 6030 C          TCF     DANZIG

R1217                MPAC SHIFT RIGHT AND ROUND SUBROUTINES.

1218  REF 433  LAST 112C  CO,2050  3 0156 C  MPACSRND CA      MPAC +2     WE HAVE TO DO ALL THREE MULTIPLIES SINCE
1219                       CO,2051  0 0006 1          EXTEND              MPAC +1 AND MPAC +2 MIGHT HAVE SIGN
1220  REF  17  LAST 112C  CO,2052  7 0135 1          MP      MPTEMP      DISAGREEMENT WITH A SHIFT RIGHT OF 1.
1221  REF 434  LAST 112C  CO,2053  56 155 C          XCH     MPAC +1
1222                       CO,2054  0 0006 1          EXTEND
1223  REF  18  LAST 112C  CO,2055  7 0135 1          MP      MPTEMP
1224  REF 435  LAST 112C  CO,2056  56 155 C          XCH     MPAC +1     TRIAL MINOR PART.
1225  REF 181  LAST 112C  CO,2057  6 0001 C          AD      L

1226                       CO,2060  6 0000 1  VSHR2   DOUBLE              (FINISH VECTOR COMPONENT SHIFT RIGHT
1227  REF 436  LAST 112C  CO,2061  54 156 1          TS      MPAC +2     AND ROUND.
1228                       CO,2062  1 2064 C          TCF     +2
1229  REF 437  LAST 112C  CO,2063  26 155 1          ADS     MPAC +1     GUARANTEED NO OVERFLOW.

1230  REF 218  LAST 1117  CO,2064  3 4714 1          CAF     ZERO
1231  REF 438  LAST 112C  CO,2065  54 156 1          TS      MPAC +2
1232  REF 439  LAST 112C  CO,2066  56 154 1          XCH     MPAC        SETTING TO ZERO SO FOLLOWING DAS WORKS.
1233                       CO,2067  0 0006 1          EXTEND
1234  REF  19  LAST 112C  CO,2070  7 0135 1          MP      MPTEMP
1235  REF 440  LAST 112C  CO,2071  20 155 1          DAS     MPAC        AGAIN NO OVERFLOW.
1236  REF 256  LAST 1115  CO,2072  0 0002 C          TC      Q

1237  REF  20  LAST 112C  CO,2073  3 0135 C  VSHRRND CA      MPTEMP      ENTRY TO SHIFT RIGHT AND ROUND MPAC WHEN
1238                       CO,2074  0 0006 1          EXTEND              MPAC CONTAINS A VECTOR COMPONENT.
1239  REF 441  LAST 112C  CO,2075  7 0155 1          MP      MPAC +1
1240  REF 442  LAST 112C  CO,2076  54 155 1          TS      MPAC +1
1241  REF 182  LAST 112C  CO,2077  56 001 C          XCH     L
1242  REF   1             CO,2100  1 2060 1          TCF     VSHR2       GO ADD ONE IF NECESSARY AND FINISH.
```

P1243 ROUTINE FOR SHORT SCALAR SHIFT LEFT (AND MAYBE ROUND).

```
 1244   REF  22  LAST 1119   00,2101  3 0021 1  TSSL    CA      SR        GET SHIFT COUNT FOR SR.
 1245   REF  21  LAST 112C   00,2102  54 135 1  +1      TS      MPTEMP

 1246                        00,2103  0 0006 1  +2      EXTEND            ENTRY HERE FROM SL FOR SCALARS.
 1247   REF 443  LAST 1120   00,2104  3 0156 0          DCA     MPAC +1   SHIFTING LEFT ONE PLACE AT A TIME IS
 1248   REF 444  LAST 1121   00,2105  20 156 1          DAS     MPAC +1   FASTER THAN DOING THE WHOLE SHIFT WITH
 1249   REF 445  LAST 1121   00,2106  6 0154 1          AD      MPAC      MULTIPLIES ASSUMING THAT FREQUENCY OF
 1250   REF 446  LAST 1121   00,2107  6 0154 1          AD      MPAC      SHIFT COUNTS GOES DOWN RAPIDLY AS A
 1251   REF 447  LAST 1121   00,2110  54 154 0          TS      MPAC      FUNCTION OF THEIR MAGNITUDE.
 1252                        00,2111  1 2113 1          TCF     +2
 1253   REF   4  LAST 1105   00,2112  54 121 1          TS      OVFIND    OVERFLOW. (LEAVES OVERFLOW-CORRECTED
A1254                                                                     RESULT ANYWAY).
 1255   REF  22  LAST 1121   00,2113  10 135 1          CCS     MPTEMP    LOOP ON DECREMENTED SHIFT COUNT.
 1256   REF   2  LAST 1119   00,2114  1 2102 1          TCF     TSSL +1

 1257   REF  32  LAST 1119   00,2115  10 020 1          CCS     CYR       SEE IF ROUND WANTED.
 1258   REF   2  LAST 1116   00,2116  0 7105 1  ROUND   TC      ROUNDSUB  YES - ROUND AND EXIT.
 1259   REF  31  LAST 112C   00,2117  1 6030 0          TCF     DANZIG    SL LEAVES A ZERO IN CYR FOR NO ROUND.
 1260   REF  32  LAST 1121   00,2120  1 6030 0          TCF     DANZIG    NO - EXIT IMMEDIATL
```

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F1261 VECTOR SHIFTING ROUTINES.

```
1262   REF   3  LAST  723   00,2121  3 4716 C  SHORTV   CAF    LOW3       SAVE 3 BIT SHIFT COUNT - 1 WITHOUT
1263   REF  33  LAST 1121   00,2122  7 0020 1            MASK   CYR        EDITING CYR.
1264   REF  23  LAST 1121   00,2123  54 135 1            TS     MPTEMP
1265   REF  34  LAST 1122   00,2124  10 020 1            CCS    CYR        SEE IF LEFT OR RIGHT SHIFT.
1266   REF   1               00,2125  1 2145 1            TCF    VSSL       VECTOR SHIFT LEFT.
1267                         00,2126   00176 1  OCT176    OCT    176        USED IN PROCESSED SHIFTS WITH - COUNT.

1268   REF  24  LAST 1122   00,2127  50 135 C  VSSR      INDEX  MPTEMP     (ENTRY FROM SR1. PICK UP SHIFTING BIT.
1269   REF  64  LAST 1119   00,2130  3 4675 1            CAF    BIT14      MPTEMP CONTAINS THE SHIFT COUNT - 1.
1270   REF  25  LAST 1122   00,2131  54 135 1            TS     MPTEMP
1271   REF   1               00,2132  0 2073 1            TC     VSHRRND    SHIFT X COMPONENT.

1272   REF 448  LAST 1121   00,2133  52 155 1            DXCH   MPAC       SWAP X AND Y COMPONENTS.
1273   REF 449  LAST 1122   00,2134  52 160 1            DXCH   MPAC +3
1274   REF 450  LAST 1122   00,2135  52 155 1            DXCH   MPAC
1275   REF   2  LAST 1122   00,2136  0 2073 1            TC     VSHRRND    SHIFT Y COMPONENT.

1276   REF 451  LAST 1122   00,2137  52 155 1            DXCH   MPAC       SWAP Y AND Z COMPONENTS.
1277   REF 452  LAST 1122   00,2140  52 162 C            DXCH   MPAC +5
1278   REF 453  LAST 1122   00,2141  52 155 1            DXCH   MPAC
1279   REF   3  LAST 1122   00,2142  0 2073 1            TC     VSHRRND    SHIFT Z COMPONENT.

1280   REF   1               00,2143  1 7367 0            TCF    VROTATEX   RESTORE COMPONENTS TO PROPER PLACES.
```

```
P1281   VECTOR SHIFT LEFT - DONE ONE PLACE AT A TIME.

 1282   REF  26  LAST 1122   00,2144  54 135 1   -1      TS      MPTEMP          SHIFTING LOOP.

 1283                        00,2145  0 0006 1   VSSL    EXTEND
 1284   REF 454  LAST 1122   00,2146  3 0159 C           DCA     MPAC
 1285   REF 455  LAST 1123   00,2147  20 155 1           DAS     MPAC
 1286                        00,2150  0 0006 1           EXTEND
 1287                        00,2151  1 2153 0           BZF     +2
 1288   REF   3  LAST 1105   00,2152  0 6766 C           TC      OVERFLOW

 1289                        00,2153  0 0006 1           EXTEND
 1290   REF 456  LAST 1123   00,2154  3 0160 C           DCA     MPAC +3
 1291   REF 457  LAST 1123   00,2155  20 160 1           DAS     MPAC +3
 1292                        00,2156  0 0006 1           EXTEND
 1293                        00,2157  1 2161 1           BZF     +2
 1294   REF   4  LAST 1115   00,2160  0 6763 C           TC      OVERFLWY

 1295                        00,2161  0 0006 1           EXTEND
 1296   REF 458  LAST 1123   00,2162  3 0162 1           DCA     MPAC +5
 1297   REF 459  LAST 1123   00,2163  20 162 C           DAS     MPAC +5
 1298                        00,2164  0 0006 1           EXTEND
 1299                        00,2165  1 2167 1           BZF     +2
 1300   REF   4  LAST 1114   00,2166  0 6760 C           TC      OVERFLWZ

 1301   REF  27  LAST 1123   00,2167  10 135 1           CCS     MPTEMP          LOOP ON DECREMENTED SHIFT COUNTER.
 1302   REF   2  LAST 1122   00,2170  1 2144 C           TCF     VSSL -1
 1303   REF  33  LAST 1121   00,2171  1 6030 C           TCF     DANZIG          EXIT.
```

P1304 TSLC - TRIPLE SHIFT LEFT AND COUNT. SHIFTS MPAC LEFT UNTIL GREATER THAN .5 IN MAGNITUDE, LEAVING
R1306 THE COMPLEMENT OF THE NUMBER OF SHIFTS REQUIRED IN X.

```
1307  REF  28  LAST 1123   00,2172  54 135 1  TSLC2     TS      MPTEMP      START BY ZEROING SHIFT COUNT (IN A NOW).
1308  REF   2  LAST 1108   00,2173  0 6672 1             TC      BRANCH      EXIT WITH NO SHIFTING IF ARGUMENT ZERO.
1309                       00,2174  1 2176 1             TCF     +2
1310  REF   1              00,2175  1 2212 C             TCF     ENDTSLC     STORES ZERO SHIFT COUNT IN THIS CASE.

1311  REF   8  LAST  68C   00,2176  0 7226 C             TC      TPAGREE     MAY CAUSE UPSHIFT OF ONE EXTRA PLACE.

1312  REF 46C  LAST 1123   CC,2177  3 0154 1             CA      MPAC        BEGIN NORMALIZATION LOOP.
1313  REF   1              00,2200  1 2207 1             TCF     TSLCTEST
1314  REF  29  LAST 1124   00,2201  24 135 C  TSLCLOOP   INCR    MPTEMP      INCREMENT SHIFT COUNTER.
1315                       CC,2202  0 0006 1             EXTEND
1316  REF 461  LAST 1124   CC,2203  3 0156 C             DCA     MPAC +1
1317  REF 462  LAST 1124   CC,2204  20 156 1             DAS     MPAC +1
1318  REF 463  LAST 1124   00,2205  6 0154 1             AD      MPAC
1319  REF 464  LAST 1124   CC,2206  26 154 C             ADS     MPAC
1320                       00,2207  6 0000 1  TSLCTEST   DOUBLE              SEE IF (ANOTHER) SHIFT IS REQUIRED.
1321                       00,2210  54 000 C             OVSK
1322  REF   1              00,2211  1 2201 1             TCF     TSLCLOOP    YES - INCREMENT COUNT AND SHIFT AGAIN.

1323  REF  30  LAST 1124   CC,2212  4 0135 1  ENDTSLC   CS      MPTEMP
1324  REF   1              00,2213  1 6572 C             TCF     STORE1      STORE SHIFT COUNT AND RETURN TO DANZIG.
```

R1325 THE FOLLOWING ROUTINES PROCESSES THE GENERAL SHIFT INSTRUCTIONS SR, SRR, SL, AND SLR.
R1327 THE GIVEN ADDRESS IS DECODED AS FOLLOWS:

R1328 BITS 1-7 SHIFT COUNT (SUBADDRESS) LESS THAN 125 DECIMAL.
R1329 BIT 8 PSEUDO SIGN BIT (DETECTS CHANGE IN SIGN IN INDEXED SHIFTS).
R1331 BIT 9 0 FOR LEFT SHIFT, AND 1 FOR RIGHT SHIFT.
R1332 BIT 10 1 FOR TERMINAL ROUND ON SCALAR SHIFTS, 0 OTHERWISE.
R1333 BITS 11-13 0.
R1334 BIT 14 1.
R1335 BIT 15 0.

R1336 THE ABOVE ENCODING IS DONE BY THE YUL SYSTEM.

```
 1337  REF  71  LAST 1118   00,2214  7 0116 0  GENSHIFT MASK   ADDRWD     GET SHIFT COUNT, TESTING FOR ZERO.
 1338  REF 295  LAST 1115   00,2215  10 000 0             CCS    A        (ARRIVES WITH C(A) = LOW7).
 1339  REF   1              00,2216  1 2224 0             TCF    GENSHFT2 IF NON-ZERO, PROCEED WITH DECREMENTED CT

 1340  REF  34  LAST  698   00,2217  3 4701 0             CAF    BIT10    ZERO SHIFT COUNT. NO SHIFTS NEEDED BUT
 1341  REF  72  LAST 1125   00,2220  7 0116 0             MASK   ADDRWD   WE MIGHT HAVE TO ROUND MPAC ON SLR AND
 1342  REF 296  LAST 1125   00,2221  10 000 0             CCS    A        SRR (SCALAR ONLY).
 1343  REF   3  LAST 1121   00,2222  0 7105 1             TC     ROUNDSUB
 1344  REF  34  LAST 1123   00,2223  1 6030 0             TCF    DANZIG

 1345  REF  31  LAST 1124   00,2224  54 135 1  GENSHFT2 TS     MPTEMP   DECREMENTED SHIFT COUNT TO MPTEMP.
 1346  REF  26  LAST 1072   00,2225  3 4703 1             CAF    BIT8     TEST MEANING OF LOW SEVEN BIT COUNT IN
 1347                       00,2226  0 0006 1             EXTEND          MPTEMP NOW.
 1348  REF  73  LAST 1125   00,2227  7 0116 0             MP     ADDRWD
 1349  REF   1              00,2230  7 6214 1             MASK   LOW2     JUMPS ON SHIFT DIRECTION (BIT8) AND
 1350  REF 297  LAST 1125   00,2231  50 000 1             INDEX  A
 1351                       00,2232  1 2233 0             TCF    +1       ORIGINAL SHIFT DIRECTION (BIT 9).
 1352  REF   1              00,2233  1 2332 0             TCF    RIGHT-   NEGATIVE SHIFT COUNT FOR SL OR SLR.
 1353  REF   1              00,2234  1 2342 1             TCF    LEFT     SL OR SLR.
 1354  REF   1              00,2235  1 2336 1             TCF    LEFT-    NEGATIVE SHIFT COUNT WITH SR OR SRR.
```

P1355 GENERAL SHIFT RIGHT.

```
 1356   REF  20  LAST 1118   00,2236  10 163 1  RIGHT    CCS    MODE      SEE IF VECTOR OR SCALAR.
 1357   REF   1               00,2237  1 2277 0           TCF    GENSCR
 1358   REF   2  LAST 1126   00,2240  1 2277 0           TCF    GENSCR

 1359   REF  32  LAST 1125   00,2241  3 0135 0           CA     MPTEMP    SEE IF SHIFT COUNT LESS THAN 14D.
 1360   REF   1               00,2242  6 3726 1  VRIGHT2  AD     NEG12
 1361                        00,2243  0 0006 1           EXTEND
 1362   REF   1               00,2244  6 2127 1           BZMF   VSSR      IF SO, BRANCH AND SHIFT IMMEDIATELY.

 1363   REF  25  LAST 1119   00,2245  6 7716 0           AD     NEGONE    IF NOT, REDUCE MPTEMP BY A TOTAL OF 14,
 1364   REF  33  LAST 1126   00,2246  54 135 1           TS     MPTEMP    AND DO A SHIFT RIGHT AND ROUND BY 14.
 1365   REF 219  LAST 1120   00,2247  3 4714 1           CAF    ZERO      THE ROUND AT THIS STAGE MAY INTRODUCE A
 1366   REF 183  LAST 1120   00,2250  54 001 1           TS     L         ONE BIT ERROR IN A SHIFT RIGHT 15D.
 1367   REF 465  LAST 1124   00,2251  56 154 1           XCH    MPAC
 1368   REF 466  LAST 1126   00,2252  56 155 0           XCH    MPAC +1
 1369   REF   1               00,2253  0 2272 1           TC     SETRCUND  X COMPONENT NOW SHIFTED, SO MAKE UP THE
 1370   REF 467  LAST 1126   00,2254  20 155 1           DAS    MPAC      ROUNDING QUANTITY (0 IN A AND 0 OR +-1
A1371                                                                     IN L).
 1372   REF 468  LAST 1126   00,2255  56 157 1           XCH    MPAC +3   REPEAT THE ABOVE PROCESS FOR Y AND Z.
 1373   REF 469  LAST 1126   00,2256  56 160 0           XCH    MPAC +4
 1374   REF   2  LAST 1126   00,2257  0 2272 1           TC     SETRCUND
 1375   REF 470  LAST 1126   00,2260  20 160 1           DAS    MPAC +3   NO OVERFLOW ON THESE ADDS.

 1376   REF 471  LAST 1126   00,2261  56 161 1           XCH    MPAC +5
 1377   REF 472  LAST 1126   00,2262  56 162 1           XCH    MPAC +6
 1378   REF   3  LAST 1126   00,2263  0 2272 1           TC     SETRCUND
 1379   REF 473  LAST 1126   00,2264  20 162 0           DAS    MPAC +5

 1380   REF  34  LAST 1126   00,2265  10 135 1           CCS    MPTEMP    SEE IF DONE, DOING FINAL DECREMENT.
 1381   REF  35  LAST 1126   00,2266  54 135 1           TS     MPTEMP
 1382   REF   1               00,2267  1 2242 0           TCF    VRIGHT2
 1383                        00,2270   04604 1  BIASLO   DEC    .2974 B-1 SQRT CONSTANT

 1384   REF  35  LAST 1125   00,2271  1 6030 0           TCF    DANZIG

 1385                        00,2272  6 0000 1  SETRCUND DOUBLE             MAKES UP ROUNDING QUANTITY FROM ARRIVING
 1386   REF 474  LAST 1126   00,2273  54 156 1           TS     MPAC +2   C(A). L IS ZERO INITIALLY.
 1387   REF 220  LAST 1126   00,2274  3 4714 1           CAF    ZERO
 1388   REF 184  LAST 1126   00,2275  56 001 0           XCH    L
 1389   REF 257  LAST 1120   00,2276  0 0002 0           TC     Q         RETURN AND DO THE DAS, RESETTING L TO 0.
```

P1390 PROCESS SR AND SRR FOR SCALARS.

```
1391  REF  36  LAST 1126  00,2277  3 0135 C  GENSCR  CA    MPTEMP    SEE IF THE ORIGINAL SHIFT COUNT WAS LESS
1392  REF   2  LAST 1126  00,2300  6 3726 1    +1    AD    NEG12     THAN 14D.
1393                       00,2301  0 0006 1          EXTEND
1394  REF   1             00,2302  6 2322 C          BZMF  DOSSHFT   DO THE SHIFT IMMEDIATELY IF SO.

1395  REF  26  LAST 1126  00,2303  6 7716 C    +4    AD    NEGONE    IF NOT, DECREMENT SHIFT COUNT BY 14D AND
1396  REF  37  LAST 1127  00,2304  54 135 1          TS    MPTEMP    SHIFT MPAC RIGHT 14 PLACES.
1397  REF 221  LAST 1126  00,2305  3 4714 1          CAF   ZERO
1398  REF 475  LAST 1126  00,2306  56 154 1          XCH   MPAC
1399  REF 476  LAST 1127  00,2307  56 155 C          XCH   MPAC +1
1400  REF 477  LAST 1127  00,2310  54 156 1          TS    MPAC +2
1401  REF  38  LAST 1127  00,2311  10 135 1          CCS   MPTEMP    SEE IF FINISHED, DO FINAL DECREMENT.
1402  REF  39  LAST 1127  00,2312  54 135 1          TS    MPTEMP
1403  REF   3  LAST 1126  00,2313  0 2300 C          TC    GENSCR +1
1404                       00,2314   22650 1  SLOPEHI  DEC   .5884     SQRT CONSTANT.
1405  REF  35  LAST 1125  00,2315  3 4701 C          CAF   BIT1        FINISHED WITH SHIFT. SEE IF ROUND
1406  REF  74  LAST 1125  00,2316  7 0116 C          MASK  ADDRWD      WANTED.
1407  REF 298  LAST 1125  00,2317  10 000 C          CCS   A
1408  REF   4  LAST 1125  00,2320  0 7105 1          TC    ROUNDSUB
1409  REF  36  LAST 1126  00,2321  1 6030 C          TCF   DANZIG      DO SO AND/OR EXIT.

1410  REF  40  LAST 1127  00,2322  50 135 C  DOSSHFT  INDEX MPTEMP    PICK UP SHIFTING BIT.
1411  REF  65  LAST 1122  00,2323  3 4675 1          CAF   BIT14
1412  REF  41  LAST 1127  00,2324  54 135 1          TS    MPTEMP
1413  REF  36  LAST 1127  00,2325  3 4701 C          CAF   BIT1        SEE IF TERMINAL ROUND DESIRED.
1414  REF  75  LAST 1127  00,2326  7 0116 C          MASK  ADDRWD
1415  REF 299  LAST 1127  00,2327  10 000 C          CCS   A
1416  REF   1             00,2330  1 2031 C          TCF   RIGHTR      YES.
1417  REF   1             00,2331  1 2033 1          TCF   MPACSHR     JUST SHIFT RIGHT.
```

P1418 PROCESS THE RIGHT- (SL(R) WITH A NEGATIVE COUNT), LEFT-, AND LEFT OPTIONS.

```
1420  REF  42  LAST 1127  00,2332  4 0135 1  RIGHT-  CS    MPTEMP   GET ABSOLUTE VALUE - 1 OF SHIFT COUNT
1421  REF   1              00,2333  6 2126 0          AD    OCT176   UNDERSTANDING THAT BIT8 (PSEUDO-SIGN)
1422  REF  43  LAST 1128  00,2334  54 135 1          TS    MPTEMP   WAS 1 INITIALLY.
1423  REF   1              00,2335  1 2236 0          TCF   RIGHT    DO NORMAL SHIFT RIGHT.

1424  REF   2  LAST 1128  00,2336  4 2126 1  LEFT-   CS    OCT176   SAME PROLOGUE TO LEFT FOR INDEXED RIGHT
1425  REF  44  LAST 1128  00,2337  6 0135 0          AD    MPTEMP   SHIFTS WHOSE NET SHIFT COUNT IS NEGATIVE
1426                      00,2340  4 0000 0          COM
1427  REF  45  LAST 1128  00,2341  54 135 1          TS    MPTEMP

1428  REF  21  LAST 1126  00,2342  10 163 1  LEFT    CCS   MODE     SINCE LEFT SHIFTING IS SONE ONE PLACE AT
1429  REF   1              00,2343  1 2346 0          TCF   GENSCL   A TIME, NO COMPARISON WITH 14 NEED BE
1430  REF   2  LAST 1128  00,2344  1 2346 0          TCF   GENSCL   DONE. FOR SCALARS, SEE IF TERMINAL ROUND
1431  REF   3  LAST 1123  00,2345  1 2145 1          TCF   VSSL     DESIRED. FOR VECTORS, SHIFT IMMEDIATELY.

1432  REF  76  LAST 1127  00,2346  4 0116 0  GENSCL  CS    ADDRWD   PUT ROUNDING BIT (BIT 10 OF ADDRWD)INTO
1433                      00,2347  0 0006 1          EXTEND         BIT 15 OF CYR WHERE THE ROUNDING BIT OF
1434  REF  44  LAST 1031  00,2350  7 4705 0          MP    BIT6     A SHORT SHIFT LEFT WOULD BE
1435  REF  35  LAST 1122  00,2351  54 020 1          TS    CYR
1436  REF   3  LAST 1121  00,2352  1 2103 0          TCF   TSSL +2  DO THE SHIFT.
```

P1437 SCALAR DIVISION INSTRUCTIONS, DDV AND BDDV, ARE EXECUTED HERE. AT THIS POINT, THE DIVIDEND IS IN MPAC
R1439 AND THE DIVISOR IN BUF.

1440	REF 136	LAST 1117	00,2353	4 4712	C	DDV/BDDV	CS	ONE	INITIALIZATION.
1441	REF 1		00,2354	54 136	1		TS	DVSIGN	+-1 FOR POSITIVE QUOTIENT - -0 FOR NEG.
1442	REF 1		00,2355	54 137	C		TS	DVNORMCT	DIVIDEND NORMALIZATION COUNT.
1443	REF 1		00,2356	54 140	C		TS	MAXDVSW	NEAR-ONE DIVIDE FLAG.
1444	REF 55	LAST 1117	00,2357	10 130	1		CCS	BUF	FORCE BUF POSITIVE WITH THE MAJOR PART
1445	REF 1		00,2360	1 2516	C		TCF	BUFPOS	NON-ZERO.
1446			00,2361	1 2363	1		TCF	+2	
1447	REF 1		00,2362	1 2531	C		TCF	BUFNEG	
1448	REF 478	LAST 1127	00,2363	54 156	1	BUFZERO	TS	MPAC +2	ZERO THIS.
1449	REF 9	LAST 1124	00,2364	0 7226	C		TC	TPAGREE	FORCE SIGN AGREEMENT BEFORE OVERFLOW
1450	REF 479	LAST 1129	00,2365	10 154	C		CCS	MPAC	TEST TO SEE IF MPAC NON-ZERO. (TOO BIG)
1451	REF 1		00,2366	1 2414	C		TCF	OVF+	MAJOR PART OF DIVIDEND IS POSITIVE NON-0
1452			00,2367	1 2371	1		TCF	+2	
1453	REF 2	LAST 1129	00,2370	1 2413	1		TCF	OVF+ -1	MAJOR PART OF DIVIDEND IS NEG. NON-ZERO
1454	REF 56	LAST 1129	00,2371	56 131	1		XCH	BUF +1	SHIFT DIVIDEND AND DIVISOR LEFT 14.
1455	REF 57	LAST 1129	00,2372	56 130	C		XCH	BUF	
1456	REF 480	LAST 1129	00,2373	56 155	0		XCH	MPAC +1	
1457	REF 481	LAST 1129	00,2374	56 154	1		XCH	MPAC	
1458	REF 58	LAST 1129	00,2375	10 130	1		CCS	BUF	TRY AGAIN ON FORMER MINOR PART.
1459	REF 1		00,2376	1 2422	C		TCF	BUF+	
1460			00,2377	1 2401	1		TCF	+2	OVERFLOW ON ZERO DIVISOR.
1461	REF 1		00,2400	1 2416	1		TCF	BUF-	
1462	REF 482	LAST 1129	00,2401	4 0154	C		CS	MPAC	SIGN OF MPAC DETERMINES SIGN OF RESULT.
1463			00,2402	0 0006	1	SGNDVOVF	EXTEND		
1464			00,2403	6 2405	1		BZMF	+2	
1465	REF 2	LAST 1129	00,2404	24 136	C		INCR	DVSIGN	NEGMAX IN MPAC PERHAPS.
1466	REF 30	LAST 1108	00,2405	3 4672	C	DVOVF	CAF	POSMAX	ON DIVISION OVERFLOW OF ANY SORT, SET
1467	REF 483	LAST 1129	00,2406	54 154	C		TS	MPAC	SET DP MPAC TO +-POSMAX.
1468	REF 1		00,2407	0 2630	C		TC	FINALDV +3	
1469	REF 137	LAST 1129	00,2410	3 4712	1		CAF	ONE	SET OVERFLOW INDICATOR AND EXIT.
1470	REF 5	LAST 1121	00,2411	54 121	1		TS	OVFIND	
1471	REF 37	LAST 1127	00,2412	0 6030	1		TC	DANZIG	
1472	REF 3	LAST 1129	00,2413	24 136	C	-1	INCR	DVSIGN	
1473	REF 59	LAST 1129	00,2414	4 0131	C	OVF+	CS	BUF +1	LOAD LOWER ORDER PART OF DIVISOR.
1474	REF 1		00,2415	1 2402	1		TCF	SGNDVOVF	GET SIGN OF RESULT.
1475			00,2416	0 0006	1	BUF-	EXTEND		IF BUF IS NEGATIVE, COMPLEMENT IT AND
1476	REF 60	LAST 1129	00,2417	4 0131	C		DCS	BUF	MAINTAIN DVSIGN FOR FINAL QUOTIENT SIGN.
1477	REF 61	LAST 1129	00,2420	52 131	C		DXCH	BUF	
1478	REF 4	LAST 1129	00,2421	24 136	C		INCR	DVSIGN	NOW -0.

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1479   REF 484  LAST 1129   00,2422  10 154 C  BUF+     CCS     MPAC      FORCE MPAC POSITIVE, CHECKING FOR ZERO
1480   REF   1               00,2423  1 2437 1           TCF     MPAC+     DIVIDEND IN THE PROCESS.
1481                         00,2424  1 2426 1           TCF     +2
1482   REF   1               00,2425  1 2433 C           TCF     MPAC-
1483   REF 485  LAST 113C    00,2426  10 155 1           CCS     MPAC +1
1484   REF   2  LAST 113C    00,2427  1 2437 1           TCF     MPAC+
1485   REF  38  LAST 1129    00,2430  1 6030 C           TCF     DANZIG    EXIT IMMEDIATELY ON ZERO DIVIDEND.
1486   REF   2  LAST 113C    00,2431  1 2433 C           TCF     MPAC-
1487   REF  39  LAST 113C    00,2432  1 6030 C           TCF     DANZIG

1488                         00,2433  0 0006 1  MPAC-     EXTEND            FORCE MPAC POSITIVE AS BUF IN BUF-.
1489   REF 486  LAST 113C    00,2434  4 0155 1           DCS     MPAC
1490   REF 487  LAST 113C    00,2435  52 155 1           DXCH    MPAC
1491   REF   5  LAST 1129    00,2436  24 136 C           INCR    DVSIGN    NOW +1 OR -0.
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1492	REF 488	LAST 1130	00,2437	4 0154 0	MPAC+	CS	MPAC	CHECK FOR DIVISION OVERFLOW. IF THE
1493	REF 27	LAST 1127	00,2440	6 7716 0		AD	NEGONE	MAJOR PART OF THE DIVIDEND IS LESS THAN
1494	REF 62	LAST 1129	00,2441	6 0130 0		AD	BUF	THE MAJOR PART OF THE DIVISOR BY AT
1495	REF 300	LAST 1127	00,2442	10 000 0		CCS	A	LEAST TWO, WE CAN PROCEED IMMEDIATELY
1496	REF 1		00,2443	1 2505 1		TCF	DVNORM	WITHOUT NORMALIZATION PRODUCING A DVMAX.
1497			00,2444	60001 0	-1/2+2	OCT	60001	USED IN SQRTSUB.
1498			00,2445	1 2446 1		TCF	+1	IF THE ABOVE DOES NOT HOLD, FORCE SIGN
1499	REF 11	LAST 1115	00,2446	3 4675 1		CAF	HALF	AGREEMENT IN NUMERATOR AND DENOMINATOR
1500			00,2447	6 0000 1		DOUBLE		TO FACILITATE OVERFLOW AND NEAR-ONE
1501	REF 489	LAST 1131	00,2450	6 0155 0		AD	MPAC +1	CHECKING.
1502	REF 490	LAST 1131	00,2451	54 155 1		TS	MPAC +1	
1503	REF 222	LAST 1127	00,2452	3 4714 1		CAF	ZERO	
1504	REF 31	LAST 1129	00,2453	6 4672 0		AD	POSMAX	
1505	REF 491	LAST 1131	00,2454	26 154 0		ADS	MPAC	
1506	REF 12	LAST 1131	00,2455	3 4675 1		CAF	HALF	SAME FOR BUF.
1507			00,2456	6 0000 1		DOUBLE		
1508	REF 63	LAST 1131	00,2457	6 0131 1		AD	BUF +1	
1509	REF 64	LAST 1131	00,2460	54 131 0		TS	BUF +1	
1510	REF 223	LAST 1131	00,2461	3 4714 1		CAF	ZERO	
1511	REF 32	LAST 1131	00,2462	6 4672 0		AD	POSMAX	
1512	REF 65	LAST 1131	00,2463	26 130 1		ADS	BUF	
1513	REF 492	LAST 1131	00,2464	4 0154 0		CS	MPAC	CHECK MAGNITUDE OF SIGN-CORRECTED
1514	REF 66	LAST 1131	00,2465	6 0130 0		AD	BUF	OPERANDS.
1515	REF 301	LAST 1131	00,2466	10 000 0		CCS	A	
1516	REF 2	LAST 1131	00,2467	1 2505 1		TCF	DVNORM	DIVIDE OK - WILL NOT BECOME MAXDV CASE.
1517	REF 13	LAST 1111	00,2470	00133 0	LBUF2	ADRES	BUF2	
1518	REF 1		00,2471	1 2405 0		TCF	DVOVF	DIVISOR NOT LESS THAN DIVIDEND - OVF.
1519	REF 2	LAST 1129	00,2472	54 140 0		TS	MAXDVSW	IF THE MAJOR PARTS OF THE DIVIDEND AND
1520	REF 493	LAST 1131	00,2473	4 0155 1		CS	MPAC +1	DIVISOR ARE EQUAL, A SPECIAL APPROXIMA-
1521	REF 67	LAST 1131	00,2474	6 0131 1		AD	BUF +1	TION IS USED (PROVIDED THE DIVISION IS
1522			00,2475	0 0006 1		EXTEND		POSSIBLE, OF COURSE).
1523	REF 2	LAST 1131	00,2476	6 2405 1		BZMF	DVOVF	
1524	REF 3	LAST 1131	00,2477	1 2505 1		TCF	DVNORM	IF NO OVERFLOW.

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1525                          00,2500  0 0006 1  BUFNORM  EXTEND              ADD -1 TO AUGMENT SHIFT COUNT AND SHIFT
1526  REF   2  LAST 1129     00,2501  24 137 1           AUG     DVNORMCT     LEFT ONE PLACE.
1527                          00,2502  0 0006 1           EXTEND
1528  REF  68  LAST 1131     00,2503  3 0131 1           DCA     BUF
1529  REF  69  LAST 1132     00,2504  20 131 0           DAS     BUF

1530  REF  70  LAST 1132     00,2505  3 0130 0  DVNORM   CA      BUF          SEE IF DIVISOR NORMALIZED YET.
1531                          00,2506  6 0000 1           DOUBLE
1532                          00,2507  54 000 0           OVSK
1533  REF   1                00,2510  1 2500 1           TCF     BUFNORM      NO - SHIFT LEFT ONE AND TRY AGAIN.

1534  REF 494  LAST 1131     00,2511  52 155 1           DXCH    MPAC         CALL DIVIDEND NORMALIZATION SEQUENCE
1535  REF   3  LAST 1132     00,2512  50 137 1           INDEX   DVNORMCT     PRIOR TO DOING THE DIVIDE.
1536  REF   1                00,2513  0 2565 0           TC      MAXTEST

1537  REF 495  LAST 1132     00,2514  54 156 1           TS      MPAC +2      RETURNS WITH DIVISION DONE AND C(A) = 0.
1538  REF  40  LAST 1130     00,2515  1 6030 0           TCF     DANZIG

1539  REF 302  LAST 1131     00,2516  10 000 0  BUFPOS   CCS     A
1540  REF   2  LAST 1129     00,2517  1 2422 0           TCF     BUF+         TO BUF+ IF BUF IS GREATER THAN +1.

1541  REF  71  LAST 1132     00,2520  4 0131 0           CS      BUF +1       IF BUF IS +1, FORCING SIGN AGREEMENT
1542                          00,2521  0 0006 1           EXTEND               MAY CAUSE BUF TO BECOME ZERO.
1543  REF   3  LAST 1132     00,2522  6 2422 1           BZMF    BUF+         BRANCH IF SIGNS AGREE.

1544  REF  13  LAST 1131     00,2523  3 4675 1           CA      HALF         SIGNS DISAGREE.  FORCE AGREEMENT.
1545                          00,2524  6 0000 1  +6       DOUBLE
1546  REF  72  LAST 1132     00,2525  26 131 0           ADS     BUF +1
1547  REF 224  LAST 1131     00,2526  3 4714 1           CA      ZERO
1548  REF  73  LAST 1132     00,2527  54 130 1           TS      BUF
1549  REF   1                00,2530  1 2363 1           TCF     BUFZERO


1550  REF 303  LAST 1132     00,2531  10 000 0  BUFNEG   CCS     A
1551  REF   2  LAST 1129     00,2532  1 2416 1           TCF     BUF-         TO BUF- IF BUF IS LESS THAN -1.

1552  REF  74  LAST 1132     00,2533  3 0131 1           CA      BUF +1       IF BUF IS -1, FORCING SIGN AGREEMENT
1553                          00,2534  0 0006 1           EXTEND               MAY CAUSE BUF TO BECOME ZERO.
1554  REF   3  LAST 1132     00,2535  6 2416 0           BZMF    BUF-         BRANCH IF SIGNS AGREE.

1555  REF  14  LAST 1132     00,2536  4 4675 0           CS      HALF         SIGNS DISAGREE.  FORCE AGREEMENT.
1556  REF   2  LAST 1129     00,2537  1 2524 1           TCF     BUFPOS +6
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P1557                THE FOLLOWING ARE PROLOGUES TO SHIFT THE DIVIDEND ARRIVING IN A AND L BEFORE THE DIVIDE.

 1559  REF  23  LAST 1121   00,2540  22 021 1   -210   LXCH   SR          SPECIAL PROLOGUE FOR UNIT WHEN THE
 1560                       00,2541  0 0006 1           EXTEND             LENGTH OF THE ARGUMENT WAS NOT LESS THAN
 1561  REF  15  LAST 1132   00,2542  7 4675 C           MP     HALF        .5. IN THIS CASE, EACH COMPONENT MUST BE
 1562  REF 185  LAST 1126   00,2543  56 001 0           XCH    L           SHIFTED RIGHT ONE TO PRODUCE A HALF-UNIT
 1563  REF  24  LAST 1133   00,2544  6 0021 1           AD     SR          VECTOR.
 1564  REF 186  LAST 1133   00,2545  56 001 C           XCH    L
 1565  REF   1              00,2546  1 2571 1           TCF    GENDDV +1   WITH DP DIVIDEND IN A,L.

 1566                       00,2547  20 001 1           DDOUBL             PROLOGUE WHICH NORMALIZES THE DIVIDEND
 1567                       00,2550  20 001 1           DDOUBL             WHEN IT IS KNOWN THAT NO DIVISION
 1568                       00,2551  20 001 1           DDOUBL             OVERFLOW WILL OCCUR.
 1569                       00,2552  20 001 1           DDOUBL
 1570                       00,2553  20 001 1           DDOUBL
 1571                       00,2554  20 001 1           DDOUBL
 1572                       00,2555  20 001 1           DDOUBL
 1573                       00,2556  20 001 1           DDOUBL
 1574                       00,2557  20 001 1           DDOUBL
 1575                       00,2560  20 001 1           DDOUBL
 1576                       00,2561  20 001 1           DDOUBL
 1577                       00,2562  20 001 1           DDOUBL
 1578                       00,2563  20 001 1           DDOUBL
 1579  REF 496  LAST 1132   00,2564  52 155 1           DXCH   MPAC

 1580  REF   3  LAST 1131   00,2565  10 140 C  MAXTEST  CCS    MAXDVSW     0 IF MAJORS MIGHT BE =, -1 OTHERWISE.
 1581                       00,2566   06552 C  BIASHI   DEC    .4192 B-1   SQRT CONSTANTS

 1582  REF   1              00,2567  1 2642 1           TCF    MAXDV       CHECK TO SEE IF THEY ARE NOW EQUAL.
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R1583           THE FOLLOWING IS A GENERAL PURPOSE DOUBLE PRECISION DIVISION ROUTINE. IT DIVIDES MPAC BY BUF AND LEAVES
R1585   THE RESULT IN MPAC. THE FOLLOWING CONDITIONS MUST BE SATISFIED:

R1586           1.  THE DIVISOR (BUF) MUST BE POSITIVE AND NOT LESS THAN .5.

R1587           2.  THE DIVIDEND (MPAC) MUST BE POSITIVE WITH THE MAJOR PART OF MPAC STRICTLY LESS THAN THAT OF BUF
R1589   (A SPECIAL APPROXIMATION, MAXDV, IS USED WHEN THE MAJOR PARTS ARE EQUAL).

R1591           UNDERSTANDING THAT A/B = Q + S(R/B) WHERE S = 2(-14) AND Q AND R ARE QUOTIENT AND REMAINDER, RESPEC-
R1593   TIVELY, THE FOLLOWING APPROXIMATION IS OBTAINED BY MULTIPLYING ABOVE AND BELOW BY C - SD AND NEGLECTING TERMS OF
R1595   ORDER S-SQUARED (POSSIBLY INTRODUCING ERROR INTO THE LOW TWO BITS OF THE RESULT). SIGN AGREEMENT IS UNNECESSARY.

R1597           A + SB .      (R - QD)                                          A + SB
R1599           ------ = Q + S(-------) WHERE Q AND R ARE QUOTIENT AND REMAINDER OF ------ RESPECTIVELY.
R1601           C + SD        (  C   )                                           C


 1603  REF 497  LAST 1133   00,2570  52 155 1  GENDDV  DXCH   MPAC          WE NEED A AND B ONLY FOR FIRST DV.
 1604                       00,2571  0 0006 1    +1     EXTEND              (SPECIAL UNIT PROLOGUE ENTERS HERE).
 1605  REF  75  LAST 1132   00,2572  10 130 1           DV     BUF          A NOW CONTAINS Q AND L, R.
 1606  REF 498  LAST 1134   00,2573  52 155 1           DXCH   MPAC

 1607  REF 499  LAST 1134   00,2574  4 0154 0           CS     MPAC         FORM DIVIDEND FOR MINOR PART OF RESULT.
 1608                       00,2575  0 0006 1           EXTEND
 1609  REF  76  LAST 1134   00,2576  7 0131 0           MP     BUF +1
 1610  REF 500  LAST 1134   00,2577  6 0155 0           AD     MPAC +1      OVERFLOW AT THIS POINT IS POSITIVE SINCE
 1611                       00,2600  54 000 0           OVSK                R IS POSITIVE IN EVERY CASE.
 1612                       00,2601  1 2606 1           TCF    +5

 1613                       00,2602  0 0006 1           EXTEND              OVERFLOW CAN BE REMOVED BY SUBTRACTING C
 1614  REF  77  LAST 1134   00,2603  60 130 0           SU     BUF          (BUF) ONCE SINCE R IS ALWAYS LESS THAN C
 1615  REF 501  LAST 1134   00,2604  24 154 1           INCR   MPAC         IN THIS CASE. INCR COMPENSATES SUBTRACT.
 1616  REF   1              00,2605  1 2610 0           TCF    +DOWN        (SINCE C(A) IS STILL POSITIVE).

 1617                       00,2606  0 0006 1    +5     EXTEND              C(A) CAN BE MADE LESS THAN C IN MAGNI-
 1618  REF   1              00,2607  6 2620 1           BZMF   -UP          TUDE BY DIMINISHING IT BY C (SINCE C IS
A1619                                                                      NOT LESS THAN .5) UNLESS C(A) = 0.
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1620                          00,2610  0 0006 1  +DOWN    EXTEND
1621  REF  78  LAST 1134     00,2611  60 130 C            SU      BUF       IF POSITIVE, REDUCE ONLY IF NECESSARY
1622                          00,2612  0 0006 1           EXTEND            SINCE THE COMPENSATING INCR MIGHT CAUSE
1623                          00,2613  1 2616 C           BZF     +3        OVERFLOW.
1624                          00,2614  0 0006 1           EXTEND            DONT SUBTRACT UNLESS RESULT IS POSITIVE
1625  REF   1                 00,2615  6 2624 C           BZMF    ENDMAXDV  OR ZERO.

1626  REF 502  LAST 1134      00,2616  24 154 1   +3      INCR    MPAC      KEEP SUBTRACT HERE AND COMPENSATE.
1627  REF   2  LAST 1129      00,2617  1 2625 C           TCF     FINALDV

1628                          00,2620  0 0006 1  -UP      EXTEND            IF ZERO, SET MINOR PART OF RESULT TO
1629  REF   3  LAST 1139      00,2621  1 2630 1           BZF     FINALDV +3 ZERO.

1630                          00,2622  0 0006 1           EXTEND            IF NEGATIVE, ADD C TO A, SUBTRACTING ONE
1631  REF 503  LAST 1135      00,2623  26 154 C           DIM     MPAC      TO COMPENSATE. DIM IS OK HERE SINCE THE
1632  REF  79  LAST 1135      00,2624  6 0130 C  ENDMAXDV AD      BUF       MAJOR PART NEVER GOES NEGATIVE.
```

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1633                          00,2625  22 0C7 C  FINALDV  ZL                DO DV TO OBTAIN MINOR PART OF RESULT.
1634                          00,2626  0 0006 1           EXTEND
1635  REF  80  LAST 1135     CO,2627  1C 130 1          DV      BUF
1636  REF 5C4  LAST 1135     CO,2630  54 155 1  +3      TS      MPAC +1

1637  REF   6  LAST 113C     00,2631  10 136 1          CCS     DVSIGN    LEAVE RESULT POSITIVE UNLESS C(DVSIGN)=
1638  REF 258  LAST 1126      00,2632  0 0002 C          TC      Q         -0.
1639  REF 259  LAST 1136      00,2633  0 0002 C          TC      Q
1640  REF 260  LAST 1136      00,2634  0 0002 C          TC      Q

1641                          00,2635  0 0006 1           EXTEND
1642  REF 5C5  LAST 1136      00,2636  4 0155 1          DCS     MPAC
1643  REF 5C6  LAST 1136      00,2637  52 155 1          DXCH    MPAC
1644  REF 225  LAST 1132      00,2640  3 4714 1          CAF     ZERO      SO WE ALWAYS RETURN WITH C(A) = 0.
1645  REF 261  LAST 1136      00,2641  0 0002 C          TC      Q
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P1646           IF THE MAJOR PARTS OF THE DIVISOR AND DIVIDEND ARE EQUAL, BUT THE MINOR PARTS ARE SUCH THAT THE
R1648   DIVIDEND IS STRICTLY LESS THAN THE DIVISOR IN MAGNITUDE, THE FOLLOWING APPROXIMATION IS USED. THE ASSUMPTIONS
R1650   ARE THE SAME AS THE GENERAL ROUTINE WITH THE ADDITION THAT SIGN AGREEMENT IS NECESSARY (B, C, & D POSITIVE).

R1652                   C + SB .          (C + B - C)
R1653                   ------ = 37777 + S(---------)
R1654                   C + SD            (    C    )

R1655           THE DIVISION MAY BE PERFORMED IMMEDIATELY SINCE B IS STRICTLY LESS THAN D AND C IS NOT LESS THAN .5.


 1657   REF 507  LAST 1136   00,2642  4 0154 C  MAXDV   CS      MPAC      SEE IF MAXDV CASE STILL HOLDS AFTER
 1658   REF  81  LAST 1136   00,2643  6 0130 0          AD      BUF       NORMALIZATION.
 1659                        00,2644  0 0006 1          EXTEND
 1660                        00,2645  1 2647 1          BZF     +2
 1661   REF   2  LAST 1133   00,2646  1 2570 C          TCF     GENDDV    MPAC NOW LESS THAN BUF - DIVIDE AS USUAL

 1662   REF  33  LAST 1131   00,2647  3 4672 C    +2    CAF     POSMAX    SET MAJOR PART OF RESULT.
 1663   REF 508  LAST 1137   00,2650  54 154 C          TS      MPAC

 1664   REF  82  LAST 1137   00,2651  4 0131 C          CS      BUF +1    FORM DIVIDEND OF MINOR PART OF RESULT.
 1665   REF 509  LAST 1137   00,2652  6 0155 C          AD      MPAC +1
 1666   REF   2  LAST 1135   00,2653  1 2624 1          TCF     ENDMAXDV  GO ADD C AND GO DIVIDE, ATTACHING SIGN
A1667                                                                    BEFORE EXITING.
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P1668 VECTOR DIVIDED BY SCALAR, V/SC, IS EXECUTED HERE. THE VECTOR IS NOW IN MPAC WITH SCALAR IN BUF.

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1670  REF 138  LAST 1129  00,2654  4 4712 C  V/SC2   CS    ONE        INITIALIZE DIVIDEND NORMALIZATION COUNT
1671  REF   4  LAST 1132  00,2655  54 137 C           TS    DVNORMCT   AND DIVISION SIGN REGISTER.
1672  REF  41  LAST 1115  00,2656  54 127 1           TS    VBUF +5

1673  REF   1             00,2657  0 3010 C           TC    VECAGREE   FORCE SIGN AGREEMENT IN VECTOR

1674  REF  83  LAST 1137  00,2660  52 131 C           DXCH  BUF
1675  REF   1             00,2661  0 7513 1           TC    ALSIGNAG   SIGN AGREE BUF
1676  REF  84  LAST 1138  00,2662  52 131 C           DXCH  BUF
1677  REF  85  LAST 1138  00,2663  10 130 1           CCS   BUF        FORCE DIVISOR POSITIVE WITH MAJOR PART
1678  REF   1             00,2664  1 2721 C           TCF   /BUF+      NON-ZERO (IF POSSIBLE).
1679                      00,2665  1 2667 C           TCF   +2
1680  REF   1             00,2666  1 2715 1           TCF   /BUF-

1681  REF  86  LAST 1138  00,2667  56 131 1           XCH   BUF +1     SHIFT VECTOR AND SCALAR LEFT 14.
1682  REF  87  LAST 1138  00,2670  56 130 C           XCH   BUF
1683  REF 510  LAST 1137  00,2671  56 155 C           XCH   MPAC +1
1684  REF 511  LAST 1138  00,2672  56 154 1           XCH   MPAC
1685                      00,2673  0 0006 1           EXTEND           CHECK FOR OVERFLOW IN EACH CASE.
1686                      00,2674  1 2676 C           BZF   +2
1687  REF   3  LAST 1131  00,2675  1 2405 C           TCF   DVOVF

1688  REF 512  LAST 1138  00,2676  56 160 C           XCH   MPAC +4
1689  REF 513  LAST 1138  00,2677  56 157 1           XCH   MPAC +3
1690                      00,2700  0 0006 1           EXTEND
1691                      00,2701  1 2703 C           BZF   +2
1692  REF   4  LAST 1138  00,2702  1 2405 C           TCF   DVOVF

1693  REF 514  LAST 1138  00,2703  56 162 1           XCH   MPAC +6
1694  REF 515  LAST 1138  00,2704  56 161 1           XCH   MPAC +5
1695                      00,2705  0 0006 1           EXTEND
1696                      00,2706  1 2710 1           BZF   +2
1697  REF   5  LAST 1138  00,2707  1 2405 C           TCF   DVOVF

1698  REF  88  LAST 1138  00,2710  10 130 1           CCS   BUF
1699  REF   2  LAST 1138  00,2711  1 2721 C           TCF   /BUF+
1700  REF   6  LAST 1138  00,2712  1 2405 C           TCF   DVOVF      ZERO DIVISOR - OVERFLOW.
1701  REF   2  LAST 1138  00,2713  1 2715 1           TCF   /BUF-
1702  REF   7  LAST 1138  00,2714  1 2405 C           TCF   DVOVF

1703                      00,2715  0 0006 1  /BUF-     EXTEND           ON NEGATIVE, COMPLEMENT BUF AND MAINTAIN
1704  REF  89  LAST 1138  00,2716  4 0131 C           DCS   BUF        DVSIGN IN VBUF +5.
1705  REF  90  LAST 1138  00,2717  52 131 C           DXCH  BUF
1706  REF  42  LAST 1138  00,2720  24 127 C           INCR  VBUF +5
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1707                          00,2721  0 0006 1  /BUF+    EXTEND
1708  REF  91  LAST 1138     00,2722  3 0131 1            DCA     BUF          LEAVE ABS(ORIG DIVISOR) IN BUF2
1709  REF  14  LAST 1131     00,2723  52 134 0            DXCH    BUF2         FOR OVERFLOW TESTING
1710  REF   1                00,2724  1 2732 1            TCF     /NORM        NORMALIZE DIVISOR IN BUF.

1711                          00,2725  0 0006 1  /NORM2   EXTEND               IF LESS THAN .5, AUGMENT DVNORMCT AND
1712  REF   5  LAST 1138     00,2726  24 137 1            AUG     DVNORMCT     DOUBLE DIVISOR.
1713                          00,2727  0 0006 1            EXTEND
1714  REF  92  LAST 1139     00,2730  3 0131 1            DCA     BUF
1715  REF  93  LAST 1139     00,2731  20 131 0            DAS     BUF

1716  REF  94  LAST 1139     00,2732  3 0130 0  /NORM     CA      BUF          SEE IF DIVISOR NORMALIZED.
1717                          00,2733  6 0000 1            DOUBLE
1718                          00,2734  54 000 0            OVSK
1719  REF   1                00,2735  1 2725 1            TCF     /NORM2       DOUBLE AND TRY AGAIN IF NOT.

1720  REF   1                00,2736  0 2750 1            TC      V/SCDV       DO X COMPONENT DIVIDE.
1721  REF 516  LAST 1138     00,2737  52 160 1            DXCH    MPAC +3      SUPPLY ARGUMENTS IN USUAL SEQUENCE.
1722  REF 517  LAST 1139     00,2740  52 155 1            DXCH    MPAC
1723  REF 518  LAST 1139     00,2741  52 160 1            DXCH    MPAC +3

1724  REF   2  LAST 1139     00,2742  0 2750 1            TC      V/SCDV       Y COMPONENT.
1725  REF 519  LAST 1139     00,2743  52 162 0            DXCH    MPAC +5
1726  REF 520  LAST 1139     00,2744  52 155 1            DXCH    MPAC
1727  REF 521  LAST 1139     00,2745  52 162 0            DXCH    MPAC +5

1728  REF   3  LAST 1139     00,2746  0 2750 1            TC      V/SCDV       Z COMPONENT.
1729  REF   2  LAST 1122     00,2747  1 7367 0            TCF     VROTATEX     GO RE-ARRANGE COMPONENTS BEFORE EXIT.
```

P1730 SUBROUTINE USED BY V/SC TO DIVIDE VECTOR COMPONENT IN MPAC,+1 BY THE SCALAR GIVEN IN BUF.

1732	REF 43	LAST 1138	00,2750	3 0127 0	V/SCDV	CA	VBUF +5	REFLECTS SIGN OF SCALAR.
1733	REF 7	LAST 1136	00,2751	54 136 1		TS	DVSIGN	
1734	REF 522	LAST 1139	00,2752	10 154 0		CCS	MPAC	FORCE MPAC POSITIVE, EXITING ON ZERO.
1735	REF 1		00,2753	1 2767 1		TCF	/MPAC+	
1736			00,2754	1 2756 0		TCF	+2	
1737	REF 1		00,2755	1 2763 0		TCF	/MPAC-	
1738	REF 523	LAST 1140	00,2756	10 155 1		CCS	MPAC +1	
1739	REF 2	LAST 1140	00,2757	1 2767 1		TCF	/MPAC+	
1740	REF 262	LAST 1136	00,2760	0 0002 0		TC	Q	
1741	REF 2	LAST 1140	00,2761	1 2763 0		TCF	/MPAC-	
1742	REF 263	LAST 1140	00,2762	0 0002 0		TC	Q	
1743			00,2763	0 0006 1	/MPAC-	EXTEND		USUAL COMPLEMENTING AND SETTING OF SIGN.
1744	REF 524	LAST 1140	00,2764	4 0155 1		DCS	MPAC	
1745	REF 525	LAST 1140	00,2765	52 155 1		DXCH	MPAC	
1746	REF 8	LAST 1140	00,2766	24 136 0		INCR	DVSIGN	
1747	REF 139	LAST 1138	00,2767	4 4712 0	/MPAC+	CS	ONE	INITIALIZE NEAR-ONE SWITCH.
1748	REF 4	LAST 1133	00,2770	54 140 0		TS	MAXDVSW	
1749	REF 526	LAST 1140	00,2771	4 0154 0		CS	MPAC	CHECK POSSIBLE OVERFLOW.
1750	REF 15	LAST 1139	00,2772	6 0133 0		AD	BUF2	UNNORMALIZED INPUT DIVISOR.
1751	REF 3004	LAST 1132	00,2773	10 000 0		CCS	A	
1752	REF 1		00,2774	1 3004 1		TCF	DDVCALL	NOT NEAR-ONE
1753			00,2775	1 2777 0		TCF	+2	+0 IS JUST POSSIBLE
1754	REF 8	LAST 1138	00,2776	1 2405 0		TCF	DVOVF	NO HOPE
1755	REF 5	LAST 1140	00,2777	54 140 0		TS	MAXDVSW	SIGNAL POSSIBLE NEAR-ONE CASE
1756	REF 527	LAST 1140	00,3000	4 0155 1		CS	MPAC +1	SEE IF DIVISION CAN BE DONE
1757	REF 16	LAST 1140	00,3001	6 0134 1		AD	BUF2 +1	
1758			00,3002	0 0006 1		EXTEND		
1759	REF 9	LAST 1140	00,3003	6 2405 1		BZMF	DVOVF	
1760	REF 528	LAST 1140	00,3004	52 155 1	DDVCALL	DXCH	MPAC	CALL PRE-DIVIDE NORMALIZATION.
1761	REF 6	LAST 1139	00,3005	50 137 1		INDEX	DVNORMCT	
1762	REF 2	LAST 1132	00,3006	1 2565 1		TCF	MAXTEST	

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1763                        00,3007   32506 C  SLOPELO  DEC    .8324

1764   REF 264  LAST 1140   00,3010   56 002 C  VECAGREE XCH    Q          SAVE Q IN A
1765   REF 529  LAST 1140   00,3011   52 155 1            DXCH   MPAC
1766   REF   2  LAST 1138   00,3012   0 7513 1            TC     ALSIGNAG   SIGNAGREE MPAC
1767   REF 530  LAST 1141   00,3013   52 155 1            DXCH   MPAC
1768   REF 531  LAST 1141   00,3014   52 160 1            DXCH   MPAC +3
1769   REF   3  LAST 1141   00,3015   0 7513 1            TC     ALSIGNAG   SIGN AGREE MPAC +3
1770   REF 532  LAST 1141   00,3016   52 160 1            DXCH   MPAC +3
1771   REF 533  LAST 1141   00,3017   52 162 C            DXCH   MPAC +5
1772   REF   4  LAST 1141   00,3020   0 7513 1            TC     ALSIGNAG   SIGNAGREE MPAC +5
1773   REF 534  LAST 1141   00,3021   52 162 C            DXCH   MPAC +5
1774   REF 305  LAST 1140   00,3022   0 0000 1            TC     A
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P1775 THE FOLLOWING ROUTINE EXECUTES THE UNIT INSTRUCTION, WHICH TAKES THE UNIT OF THE VECTOR IN MPAC.

1777	REF 2	LAST 1138	00,3023	0 3010 0	UNIT	TC	VECAGREE	FORCE SIGN AGREEMENT IN VECTOR
1778	REF 2	LAST 1111	00,3024	0 7501 1		TC	MPACVBUF	SAVE ARGUMENT IN VBUF
1779	REF 226	LAST 1136	00,3025	3 4714 1		CAF	ZERO	MUST SENSE OVERFLOW IN FOLLOWING DOT.
1780	REF 6	LAST 1129	00,3026	56 121 0		XCH	OVFIND	
1781	REF 3	LAST 67	00,3027	54 141 1		TS	TEM1	
1782	REF 1		00,3030	0 3317 1		TC	VSQSUB	DOT MPAC WITH ITSELF.
1783	REF 4	LAST 1142	00,3031	3 0141 0		CA	TEM1	
1784	REF 7	LAST 1142	00,3032	56 121 0		XCH	OVFIND	
1785			00,3033	0 0006 1		EXTEND		
1786			00,3034	1 3036 0		BZF	+2	
1787	REF 10	LAST 1140	00,3035	1 2405 0		TCF	DVOVF	
1788			00,3036	0 0006 1		EXTEND		
1789	REF 535	LAST 1141	00,3037	3 0155 0		DCA	MPAC	LEAVE THE SQUARE OF THE LENGTH OF THE
1790	REF 26	LAST 1096	00,3040	50 120 1		INDEX	FIXLOC	ARGUMENT IN LVSQUARE.
1791	REF 1		00,3041	52 043 1		DXCH	LVSQUARE	
1792	REF 1		00,3042	0 3343 0		TC	SQRTSUB	GO TAKE THE NORMALIZED SQUARE ROOT.
1793	REF 536	LAST 1142	00,3043	10 154 0		CCS	MPAC	CHECK FOR UNIT OVERFLOW.
1794			00,3044	1 3051 1		TCF	+5	MPAC IS NOT LESS THAN .5 UNLESS
1795	REF 187	LAST 1133	00,3045	54 001 1		TS	L	
1796	REF 27	LAST 1142	00,3046	50 120 1		INDEX	FIXLOC	
1797	REF 1		00,3047	52 045 1		DXCH	LV	
1798	REF 11	LAST 1142	00,3050	1 2405 0		TCF	DVOVF	INPUT TO SQRTSUB WAS 0.
1799	REF 1		00,3051	4 4333 1		CS	FOURTEEN	SEE IF THE INPUT WAS SO SMALL THE THE
1800	REF 46	LAST 1128	00,3052	6 0135 0		AD	MPTEMP	FIRST TWO REGISTERS OF THE SQUARE WERE 0
1801	REF 306	LAST 1141	00,3053	10 000 0		CCS	A	
1802			00,3054	4 0000 0		COM		IF SO, SAVE THE NEGATIVE OF THE SHIFT
1803	REF 1		00,3055	1 3133 1		TCF	SMALL	COUNT -15D.
1804	REF 1		00,3056	1 3065 0		TCF	LARGE	(THIS IS USUALLY THE CASE.)
1805	REF 4	LAST 1056	00,3057	4 4720 1		CS	THIRTEEN	IF THE SHIFT COUNT WAS EXACTLY 14, SET
1806	REF 47	LAST 1142	00,3060	54 135 1		TS	MPTEMP	THE PRE-DIVIDE NORM COUNT TO -13D.
1807	REF 537	LAST 1142	00,3061	3 0154 1		CA	MPAC	SHIFT THE LENGTH RIGHT 14 BEFORE STORING
1808	REF 188	LAST 1142	00,3062	54 001 1	SMALL2	TS	L	(SMALL EXITS TO THIS POINT).
1809	REF 227	LAST 1142	00,3063	3 4714 1		CAF	ZERO	
1810	REF 1		00,3064	1 3112 1		TCF	LARGE2	GO TO STORE LENGTH AND PROCEED.
1811	REF 48	LAST 1142	00,3065	10 135 1	LARGE	CCS	MPTEMP	MOST ALL CASES COME HERE.
1812	REF 1		00,3066	1 3074 0		TCF	LARGE3	SEE IF NO NORMALIZATION WAS REQUIRED BY
1813	REF 1		00,3067	4 2024 1		CS	SRDDV	SQRT, AND IF SO, SET UP FOR A SHIFT
1814	REF 49	LAST 1142	00,3070	54 135 1		TS	MPTEMP	RIGHT 1 BEFORE DIVIDING TO PRODUCE
1815			00,3071	0 0006 1		EXTEND		THE DESIRED HALF UNIT VECTOR.
1816	REF 538	LAST 1142	00,3072	3 0155 0		DCA	MPAC	

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1817 REF 2 LAST 1142 CC,3073 1 3112 1 TCF LARGE2

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1818                          00,3074  4 0000 C  LARGE3   COM                      LEAVE NEGATIVE OF SHIFT COUNT-1 FOR
1819  REF  50  LAST 1142     00,3075  54 135 1            TS      MPTEMP           PREDIVIDE LEFT SHIFT.

1820                          00,3076  4 0000 C            COM                      PICK UP REQUIRED SHIFTING BIT TO UNNORM-
1821  REF 307  LAST 1142     00,3077  5C 000 1            INDEX   A                ALIZE THE SQRT RESULT.
1822  REF  66  LAST 1127     00,3100  3 4675 1            CAF     BIT14
1823  REF  95  LAST 1139     00,3101  54 130 1            TS      BUF
1824                          00,3102  0 0006 1            EXTEND
1825  REF 539  LAST 1142     00,3103  7 0155 1            MP      MPAC +1
1826  REF  96  LAST 1144     00,3104  56 130 C            XCH     BUF
1827                          00,3105  0 0006 1            EXTEND                   (UNNORMALIZE THE SQRT FOR LV).
1828  REF 540  LAST 1144     00,3106  7 0154 C            MP      MPAC
1829  REF 189  LAST 1142     00,3107  56 001 C            XCH     L
1830  REF  97  LAST 1144     00,3110  6 0130 C            AD      BUF
1831  REF 190  LAST 1144     00,3111  56 001 C            XCH     L

1832  REF  28  LAST 1142     00,3112  5C 120 1  LARGE2    INDEX   FIXLOC
1833  REF   2  LAST 1142     00,3113  52 045 1            DXCH    LV               LENGTH NOW STORED IN WORK AREA.

1834  REF 140  LAST 114C     00,3114  4 4712 C            CS      ONE
1835  REF   6  LAST 114C     00,3115  54 140 C            TS      MAXDVSW          NO MAXDV CASES IN UNIT.

1836  REF  44  LAST 114C     00,3116  52 123 C            DXCH    VBUF             PREPARE X COMPONENT FOR DIVIDE, SETTING
1837  REF 541  LAST 1144     00,3117  52 155 1            DXCH    MPAC             LENGTH OF VECTOR AS DIVISOR IN BUF.
1838  REF  98  LAST 1144     00,3120  52 131 C            DXCH    BUF
1839  REF   1                00,3121  0 3151 1            TC      UNITDV

1840  REF  45  LAST 1144     00,3122  52 125 C            DXCH    VBUF +2          DO Y AND Z IN USUAL FASHION SO WE CAN
1841  REF 542  LAST 1144     00,3123  52 155 1            DXCH    MPAC             EXIT THROUGH VROTATEX.
1842  REF 543  LAST 1144     00,3124  52 160 1            DXCH    MPAC +3
1843  REF   2  LAST 1144     00,3125  0 3151 1            TC      UNITDV

1844  REF  46  LAST 1144     00,3126  52 127 1            DXCH    VBUF +4
1845  REF 544  LAST 1144     00,3127  52 155 1            DXCH    MPAC
1846  REF 545  LAST 1144     00,3130  52 162 C            DXCH    MPAC +5
1847  REF   3  LAST 1144     00,3131  0 3151 1            TC      UNITDV
1848  REF   3  LAST 1139     00,3132  1 7367 C            TCF     VROTATEX         AND EXIT.
```

P1849 IF THE LENGTH OF THE ARGUMENT VECTOR WAS LESS THAN 2(-28), EACH COMPONENT MUST BE SHIFTED LEFT AT LEAST
R1851 14 PLACES BEFORE THE DIVIDE. NOTE THAT IN THIS CASE, THE MAJOR PART OF EACH COMPONENT IS ZERO.

1853	REF 51	LAST 1144	00,3133	54 135 1	SMALL	TS	MPTEMP		NEGATIVE OF PRE-DIVIDE SHIFT COUNT.
1854	REF 228	LAST 1142	00,3134	3 4714 1		CAF	ZERO		SHIFT EACH COMPONENT LEFT 14.
1855	REF 47	LAST 1144	00,3135	56 123 1		XCH	VBUF +1		
1856	REF 48	LAST 1145	00,3136	56 122 0		XCH	VBUF		
1857	REF 49	LAST 1145	00,3137	56 125 1		XCH	VBUF +3		
1858	REF 50	LAST 1145	00,3140	56 124 0		XCH	VBUF +2		
1859	REF 51	LAST 1145	00,3141	56 127 0		XCH	VBUF +5		
1860	REF 52	LAST 1145	00,3142	56 126 1		XCH	VBUF +4		
1861	REF 52	LAST 1145	00,3143	4 0135 1		CS	MPTEMP		
1862	REF 308	LAST 1144	00,3144	50 000 1		INDEX	A		
1863	REF 67	LAST 1144	00,3145	3 4675 1		CAF	BIT14		
1864			00,3146	0 0006 1		EXTEND			
1865	REF 546	LAST 1144	00,3147	7 0154 0		MP	MPAC		
1866	REF 1		00,3150	1 3062 1		TCF	SMALL2		
1867	REF 4	LAST 721	4720		THIRTEEN	=	OCT15		
1868	REF 2	LAST 733	4333		FOURTEEN	=	OCT16		
1869	REF 14	LAST 367	4333		OCT16	=	R1D1		

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P1870 THE FOLLOWING ROUTINE SETS UP THE CALL TO THE DIVIDE ROUTINES.

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1871  REF 547  LAST 1145  00,3151  10 154 C  UNITDV  CCS   MPAC     FORCE MPAC POSITIVE IF POSSIBLE, SETTING
1872  REF   1             00,3152  1 3170 C          TCF   UMPAC+   DVSIGN ACCORDING TO THE SIGN OF MPAC
1873                      00,3153  1 3155 1          TCF   +2       SINCE THE DIVISOR IS ALWAYS POSITIVE
1874  REF   1             00,3154  1 3162 C          TCF   UMPAC-   HERE.

1875  REF 548  LAST 1146  00,3155  10 155 1          CCS   MPAC +1
1876  REF   2  LAST 1146  00,3156  1 3170 C          TCF   UMPAC+
1877  REF 265  LAST 1141  00,3157  0 0002 C          TC    Q        EXIT IMMEDIATELY ON ZERO.
1878  REF   2  LAST 1146  00,3160  1 3162 C          TCF   UMPAC-
1879  REF 266  LAST 1146  00,3161  0 0002 C          TC    Q

1880  REF 229  LAST 1145  00,3162  4 4714 C  UMPAC-  CS    ZERO     IF NEGATIVE, SET -0 IN DVSIGN FOR FINAL
1881  REF   9  LAST 1140  00,3163  54 136 1          TS    DVSIGN   COMPLEMENT.
1882                      00,3164  0 0006 1          EXTEND
1883  REF 549  LAST 1146  00,3165  4 0155 1          DCS   MPAC     PICK UP ABSOLUTE VALUE OF ARG AND JUMP.
1884  REF  53  LAST 1145  00,3166  50 135 C          INDEX MPTEMP
1885  REF   3  LAST 1140  00,3167  1 2564 C          TCF   MAXTEST -1

1886  REF  10  LAST 1146  00,3170  54 136 1  UMPAC+  TS    DVSIGN   SET DVSIGN FOR POSITIVE QUOTIENT.
1887  REF 550  LAST 1146  00,3171  52 155 1          DXCH  MPAC
1888  REF  54  LAST 1146  00,3172  50 135 C          INDEX MPTEMP
1889  REF   4  LAST 1146  00,3173  1 2564 C          TCF   MAXTEST -1
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P1890 MISCELLANECUS UNARY CPERATIONS.

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1891  REF   1              00,3174  0 3300 1  DSQ       TC      DSQSUB      SQUARE THE DP CONTENTS OF MPAC.
1892  REF  41  LAST 1132   00,3175  1 6030 C            TCF     DANZIG

1893  REF  22  LAST 1128   00,3176  10 163 1  ABVALABS  CCS     MODE        ABVAL OR ABS INSTRUCTION.
1894  REF   1              00,3177  1 3226 C            TCF     ABS         DO ABS ON SCALAR.
1895  REF   2  LAST 1147   00,3200  1 3226 C            TCF     ABS

1896  REF   2  LAST 1142   00,3201  0 3317 1  ABVAL     TC      VSQSUB      DOT MPAC WITH ITSELF.
1897  REF  23  LAST 1147   00,3202  22 163 0            LXCH    MODE        MODE IS NOW DP (L ZERO AFTER DAS).

1898                       00,3203  0 0006 1            EXTEND              STORE SQUARE OF LENGTH IN WORK AREA.
1899  REF 551  LAST 1146   00,3204  3 0155 C            DCA     MPAC
1900  REF  29  LAST 1144   00,3205  5C 120 1            INDEX   FIXLOC
1901  REF   2  LAST 1142   00,3206  52 043 1            DXCH    LVSQUARE
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P1902   PROGRAM DESCRIPTION- SUBROUTINE SQRT
R1903   FUNCTIONAL DESCRIPTION-DOUBLE PRECISION SQUARE ROOT ROUTINE
R1904       THIS PROGRAM TAKES THE SQUARE ROOT OF THE 27 OR 28 MOST SIGNIFICANT BITS IN THE TRIPLE PRECISION SET OF
R1906       NUMBERS-MPAC,MPAC+1,AND MPAC+2.  THE ROOT IS RETURNED DOUBLE          PRECISION IN MPAC AND MPAC+1.
R1908   WARNING- THIS SUBROUTINE USES A TRIPLE PRECISION INPUT. THE PROGRAMMER  MUST ASSURE THE CONTENTS OF MPAC+2
R1910       ESPECIALLY IF THE CONTENTS OF MPAC IS SMALL OR ZERO.  FOR DETAILS SEE STG MEMO NO.949.
R1912   CALLING SEQUENCE- IN INTERPRETIVE MODE I.E., FOLLOWING TC  INTPRET,SQRT   NO ADDRESS IS ALLOWED
R1914   INPUT SCALING  THE BINARY POINT IS ASSUMED TO THE RIGHT OF BIT 15. THE  ANSWER IS RETURNED WITH THE SAME SCALING
R1916   SUBROUTINES- GENSCR,MPACSHR, SQRTSUB,ABORT
R1917   ABORT EXIT MODE- ABORTS ON NEGATIVE INPUT -1.2X10E-4 (77775  OCTAL)     OR LESS.
P1919       DISPLAYS ERROR CODE 1302
R1920                   TC   ABORT
R1921                   OCT  1302
R1922   DEBRIS -  LOCATIONS BUF,MPTEMP,ADDRWD ARE USED
 1923   REF   2 LAST 1142   00,3207  0 3343 C  SQRT     TC     SQRTSUB     TAKE THE SQUARE ROOT OF MPAC.
 1924   REF  55 LAST 1146   00,3210  10 135 1          CCS    MPTEMP      RETURNED NORMALIZED SQUARE ROOT. SEE IF
 1925                       00,3211  1 3213 C          TCF    +2          ANY UN-NORMALIZATION REQUIRED AND EXIT
 1926   REF  42 LAST 1147   00,3212  1 6030 C          TCF    DANZIG      IF NOT.

 1927   REF   3 LAST 1127   00,3213  6 3726 1          AD     NEG12       A RIGHT SHIFT OF MORE THAN 13 COULD BE
 1928                       00,3214  0 0006 1          EXTEND             REQUIRED IF INPUT WAS ZERO IN MPAC,+1.
 1929   REF   1             00,3215  6 3221 C          BZMF   SQRTSHFT    GOES HERE IN MOST CASES.
 1930                       00,3216  22 007 C          ZL                 IF A LONG SHIFT IS REQUIRED, GO TO
 1931   REF  77 LAST 1128   00,3217  22 116 1          LXCH   ADDRWD      GENERAL RIGHT SHIFT ROUTINES.
 1932   REF   4 LAST 1127   00,3220  1 2303 1          TCF    GENSCR +4   ADDRWD WAS ZERO TO PREVENT ROUND.

 1933   REF  56 LAST 1148   00,3221  50 135 C  SQRTSHFT INDEX  MPTEMP      SELECT SHIFTING BIT AND EXIT THROUGH
 1934   REF  45 LAST 1098   00,3222  3 4674 C          CAF    BIT15       SHIFT ROUTINES.
 1935   REF  57 LAST 1148   00,3223  54 135 1          TS     MPTEMP
 1936   REF 230 LAST 1146   00,3224  3 4714 1          CAF    ZERO        TO ZERO MPAC +2 IN THE PROCESS.
 1937   REF   2 LAST 1127   00,3225  1 2036 1          TCF    MPACSHR +3

 1938   REF   3 LAST 1124   00,3226  0 6672 1  ABS     TC     BRANCH      TEST SIGN OF MPAC AND COMPLEMENT IF
 1939   REF  43 LAST 1148   00,3227  1 6030 C          TCF    DANZIG
 1940   REF  44 LAST 1148   00,3230  1 6030 C          TCF    DANZIG
 1941   REF   4 LAST 1118   00,3231  1 7637 C          TCF    COMP
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1942  REF  16  LAST 1113   00,3232  4 4710 1  VDEF   CS    FOUR      VECTOR DEFINE - ESSENTIALLY TREATS
1943  REF  13  LAST 1116   00,3233  26 166 1         ADS   PUSHLOC   SCALAR IN MPAC AS X COMPONENT, PUSHES UP
1944                       00,3234  0 0006 1         EXTEND          FOR Y AND THEN AGAIN FOR Z.
1945  REF 309  LAST 1145   00,3235  5 0000 1         INDEX A
1946                       00,3236  3 0003 1         DCA   2
1947  REF 552  LAST 1147   00,3237  52 160 1         DXCH  MPAC +3
1948                       00,3240  0 0006 1         EXTEND
1949  REF  14  LAST 1149   00,3241  5 0166 C         INDEX PUSHLOC
1950                       00,3242  3 0001 C         DCA   0
1951  REF 553  LAST 1149   00,3243  52 162 C         DXCH  MPAC +5
1952  REF   2  LAST 1113   00,3244  1 6470 C         TCF   VMODE     MODE IS NON VECTOR.

1953  REF   3  LAST 1147   00,3245  0 3317 1  VSQ    TC    VSQSUB    DOT MPAC WITH ITSELF.
1954  REF   1              00,3246  1 7301 C         TCF   DMODE     MODE IS NOW DP.

1955                       00,3247  0 0006 1  PUSH   EXTEND          PUSH DOWN MPAC LEAVING IT LOADED.
1956  REF 554  LAST 1149   00,3250  3 0155 C         DCA   MPAC
1957  REF  15  LAST 1149   00,3251  50 166 C         INDEX PUSHLOC   PUSH DOWN FIRST TWO REGISTERS IN EACH
1958                       00,3252  52 001 1         DXCH  0

1959  REF  24  LAST 1147   00,3253  50 163 C         INDEX MODE      INCREMENT PUSHDOWN POINTER.
1960  REF   5  LAST 1093   00,3254  3 6213 1         CAF   NO.WDS
1961  REF  16  LAST 1149   00,3255  26 166 1         ADS   PUSHLOC
1962  REF  25  LAST 1149   00,3256  10 163 1         CCS   MODE
1963  REF   1              00,3257  1 3272 1         TCF   TPUSH     PUSH DOWN MPAC +2.
1964  REF  45  LAST 1148   00,3260  1 6030 C         TCF   DANZIG    DONE FOR DP.

1965                       00,3261  0 0006 1         EXTEND          ON VECTOR, PUSH DOWN Y AND Z COMPONENTS.
1966  REF 555  LAST 1149   00,3262  3 0160 C         DCA   MPAC +3
1967  REF  17  LAST 1149   00,3263  50 166 C         INDEX PUSHLOC
1968                       00,3264  51'775 C         DXCH  0 -4
1969                       00,3265  0 0006 1         EXTEND
1970  REF 556  LAST 1149   00,3266  3 0162 1         DCA   MPAC +5
1971  REF  18  LAST 1149   00,3267  50 166 C         INDEX PUSHLOC
1972                       00,3270  51'777 1         DXCH  0 -2
1973  REF  46  LAST 1149   00,3271  1 6030 C         TCF   DANZIG

1974  REF 557  LAST 1149   00,3272  3 0156 C  TPUSH  CA    MPAC +2
1975  REF   2  LAST 1092   00,3273  1 6523 1         TCF   ENDTPUSH +2

1976  REF  30  LAST 1147   00,3274  50 120 1  RVQ    INDEX FIXLOC    RVQ - RETURN IVA QPRET.
1977  REF  18  LAST 1095   00,3275  3 0052 C         CA    QPRET
1978  REF  21  LAST 1107   00,3276  54 117 1         TS    POLISH
1979  REF   5  LAST 1096   00,3277  1 6621 C         TCF   GOTO +4   (ASSUME QPRET POINTS TO FIXED ONLY.)
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P1980 THE FOLLOWING SUBROUTINES ARE USED IN SQUARING MPAC, IN BOTH THE SCALAR AND VECTOR SENSE. THEY ARE
R1982 SPECIAL CASES OF CMPSUB AND DOTSUB, PUT IN TO SAVE SOME TIME.

1983	REF 558	LAST 1149	00,3300	3 0155 C	DSQSUB	CA	MPAC +1	SQUARES THE SCALAR CONTENTS OF MPAC.
1984			00,3301	0 0006 1		EXTEND		
1985			00,3302	7 0000 C		SQUARE		
1986	REF 559	LAST 115C	00,3303	54 156 1		TS	MPAC +2	
1987	REF 231	LAST 1148	00,3304	3 4714 1		CAF	ZERO	FORM 2(CROSS TERM).
1988	REF 560	LAST 115C	00,3305	56 155 C		XCH	MPAC +1	
1989			00,3306	0 0006 1		EXTEND		
1990	REF 561	LAST 115C	00,3307	7 0154 C		MP	MPAC	
1991			00,3310	20 001 1		DDOUBL		AND MAYBE OVERFLOW.
1992	REF 562	LAST 115C	00,3311	20 156 1		DAS	MPAC +1	AND SET A TC NET OVERFLOW.
1993	REF 563	LAST 115C	00,3312	56 154 1		XCH	MPAC	
1994			00,3313	0 0006 1		EXTEND		
1995			00,3314	7 0000 C		SQUARE		
1996	REF 564	LAST 115C	00,3315	20 155 1		DAS	MPAC	
1997	REF 267	LAST 1146	00,3316	0 0002 C		TC	Q	
1998			00,3317	0 0006 1	VSQSUB	EXTEND		DOTS THE VECTOR IN MPAC WITH ITSELF.
1999	REF 8	LAST 1105	00,3320	22 137 1		QXCH	DOTRET	
2000	REF 2	LAST 1147	00,3321	0 3300 1		TC	DSQSUB	SQUARE THE X COMPONENT.
2001	REF 565	LAST 115C	00,3322	52 160 1		DXCH	MPAC +3	
2002	REF 566	LAST 115C	00,3323	52 155 1		DXCH	MPAC	
2003	REF 99	LAST 1144	00,3324	52 131 C		DXCH	BUF	SO WE CAN END IN DOTSUB.
2004	REF 567	LAST 115C	00,3325	3 0156 C		CA	MPAC +2	
2005	REF 100	LAST 115C	00,3326	54 132 C		TS	BUF +2	
2006	REF 3	LAST 115C	00,3327	0 3300 1		TC	DSQSUB	SQUARE Y COMPONENT.
2007	REF 568	LAST 115C	00,3330	52 156 1		DXCH	MPAC +1	
2008	REF 101	LAST 115C	00,3331	20 132 C		DAS	BUF +1	
2009	REF 569	LAST 115C	00,3332	6 0154 1		AD	MPAC	
2010	REF 102	LAST 115C	00,3333	6 0130 C		AD	BUF	
2011	REF 103	LAST 115C	00,3334	54 130 1		TS	BUF	
2012			00,3335	1 3337 1		TCF	+2	
2013	REF 8	LAST 1142	00,3336	54 121 1		TS	OVFIND	IF OVERFLOW.
2014	REF 570	LAST 115C	00,3337	52 162 C		DXCH	MPAC +5	
2015	REF 571	LAST 115C	00,3340	52 155 1		DXCH	MPAC	
2016	REF 4	LAST 115C	00,3341	0 3300 1		TC	DSQSUB	SQUARE Z COMPONENT.
2017	REF 1		00,3342	1 7154 1		TCF	ENDDOT	END AS IN DOTSUB.

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R2018                DOUBLE PRECISION SQUARE ROOT ROUTINE. TAKE THE SQUARE ROOT OF THE TRIPLE PRECISION (MPAC +2 USED ONLY
R2020   IN NORMALIZATION) CONTENTS OF MPAC AND LEAVE THE NORMALIZED RESULT IN MPAC (C(MPAC) GREATER THAN OR EQUAL TO
R2022   .5). THE RIGHT SHIFT COUNT (TO UNNORMALIZE) IS LEFT IN MPTEMP.

 2023   REF 232  LAST 1150   00,3343  3 4714 1  SQRTSUB  CAF   ZERO      START BY ZEROING RIGHT SHIFT COUNT.
 2024   REF  58  LAST 1148   00,3344  54 135 1            TS    MPTEMP

 2025   REF 572  LAST 1150   00,3345  10 154 C            CCS   MPAC      CHECK FOR POSITIVE ARGUMENT, SHIFTING
 2026   REF   1              00,3346  1 3404 0            TCF   SMPAC+     FIRST SIGNIFICANT MPAC REGISTER INTO
 2027                        00,3347  1 3351 1            TCF   +2         MPAC ITSELF.
 2028   REF   1              00,3350  1 3373 1            TCF   SQRTNEG     SEE IF MAG OF ARGUMENT LESS THAN 10(-4).

 2029   REF 573  LAST 1151   00,3351  56 156 C            XCH   MPAC +2     MPAC IS ZERO - SHIFT LEFT 14.
 2030   REF 574  LAST 1151   00,3352  56 155 C            XCH   MPAC +1
 2031   REF 575  LAST 1151   00,3353  54 154 C            TS    MPAC
 2032   REF  15  LAST  902   00,3354  3 4716 C            CAF   SEVEN      AUGMENT RIGHT SHIFT COUNTER.
 2033   REF  59  LAST 1151   00,3355  54 135 1            TS    MPTEMP

 2034   REF 576  LAST 1151   00,3356  10 154 C            CCS   MPAC      SEE IF MPAC NOW PNZ.
 2035   REF   2  LAST 1151   00,3357  1 3404 C            TCF   SMPAC+
 2036                        00,3360  1 3362 1            TCF   +2
 2037   REF   1              00,3361  1 3376 1            TCF   ZEROANS    NEGATIVE BUT LESS THAN 10(-4) IN MAG.

 2038   REF 577  LAST 1151   00,3362  56 155 C            XCH   MPAC +1     ZERO - SHIFT LEFT 14 AGAIN.
 2039   REF 578  LAST 1151   00,3363  54 154 C            TS    MPAC
 2040   REF  16  LAST 1151   00,3364  3 4716 C            CAF   SEVEN      AUGMENT RIGHT SHIFT COUNTER.
 2041   REF  60  LAST 1151   00,3365  26 135 1            ADS   MPTEMP

 2042   REF 579  LAST 1151   00,3366  10 154 C            CCS   MPAC
 2043   REF   3  LAST 1151   00,3367  1 3404 C            TCF   SMPAC+
 2044   REF 268  LAST 1150   00,3370  0 0002 C            TC    Q          SQRT(0) = 0.
 2045   REF   2  LAST 1151   00,3371  1 3376 1            TCF   ZEROANS
 2046   REF   1              00,3372  1 3452 C            TCF   FIXRCOT    DO NOT LEAVE SQRTSUB WITH -0 IN MPAC.

 2047   REF 310  LAST 1149   00,3373  10 000 C  SQRTNEG   CCS   A          ARGUMENT IS NEGATIVE, BUT SEE IF SIGN-
 2048   REF   1              00,3374  1 3402 C            TCF   SQRTABRT   CORRECTED ARGUMENT IS LESS THAN 10(-4)

 2049   REF 580  LAST 1151   00,3375  10 155 1            CCS   MPAC +1    IN MAGNITUDE. IF SO, CALL ANSWER ZERO.
 2050   REF 233  LAST 1151   00,3376  3 4714 1  ZEROANS   CAF   ZERO       FORCE ANSWER TO ZERO HERE.
 2051   REF   2  LAST 1151   00,3377  1 3452 C            TCF   FIXRCOT
 2052   REF   2  LAST 1151   00,3400  1 3402 C            TCF   SQRTABRT
 2053   REF   3  LAST 1151   00,3401  1 3452 C            TCF   FIXRCOT

 2054   REF   3  LAST  365   00,3402  0 5622 1  SQRTABRT  TC    POODOO
 2055                        00,3403  01302 1             OCT   1302
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2056	REF 1		00,3404	6 2444 1	SMPAC+	AD	-1/2+2	SEE IF ARGUMENT GREATER THAN OR EQUAL TO
2057			00,3405	0 0006 1		EXTEND		.5.
2058	REF 1		00,3406	6 3455 0		BZMF	SRTEST	IF SO, SEE IF LESS THAN .25.
2059	REF 581	LAST 1151	00,3407	52 155 1		DXCH	MPAC	WE WILL TAKE THE SQUARE ROOT OF MPAC/2.
2060	REF 25	LAST 1133	00,3410	22 021 1		LXCH	SR	SHIFT RIGHT 1 AND GO TO THE SQRT ROUTINE
2061			00,3411	0 0006 1		EXTEND		
2062	REF 16	LAST 1133	00,3412	7 4675 0		MP	HALF	
2063	REF 582	LAST 1152	00,3413	52 155 1		DXCH	MPAC	
2064	REF 26	LAST 1152	00,3414	56 021 1		XCH	SR	
2065	REF 583	LAST 1152	00,3415	26 155 1		ADS	MPAC +1	GUARANTEED NO OVERFLOW.
2066	REF 1		00,3416	3 2314 0	ARGHI	CAF	SLOPEHI	ARGUMENT BETWEEN .25 AND .5. GET A
2067			00,3417	0 0006 1		EXTEND		LINEAR APPROXIMATION FOR THIS RANGE.
2068	REF 584	LAST 1152	00,3420	7 0154 0		MP	MPAC	
2069	REF 1		00,3421	6 2566 0		AD	BIASHI	X0/2 = (MPAC/2)(SLOPEHI) + BIASHI/2.
2070	REF 104	LAST 1150	00,3422	54 130 1	+4	TS	BUF	X0/2 (ARGLO ENTERS HERE).
2071	REF 585	LAST 1152	00,3423	3 0154 1		CA	MPAC	SINGLE-PRECISION THROUGHOUT.
2072			00,3424	22 007 0		ZL		
2073			00,3425	0 0006 1		EXTEND		
2074	REF 105	LAST 1152	00,3426	10 130 1		DV	BUF	(MPAC/2)/(X0/2)
2075			00,3427	0 0006 1		EXTEND		
2076	REF 17	LAST 1152	00,3430	7 4675 0		MP	HALF	
2077	REF 106	LAST 1152	00,3431	26 130 1		ADS	BUF	X1 = X0/2 + .5(MPAC/2)/(X0/2).
2078			00,3432	0 0006 1		EXTEND		
2079	REF 18	LAST 1152	00,3433	7 4675 0		MP	HALF	FORM UP X1/2.
2080	REF 586	LAST 1152	00,3434	52 155 1		DXCH	MPAC	SAVE AND BRING OUT ARGUMENT.
2081			00,3435	0 0006 1		EXTEND		TAKE DP QUOTIENT WITH X1.
2082	REF 107	LAST 1152	00,3436	10 130 1		DV	BUF	
2083	REF 108	LAST 1152	00,3437	54 131 0		TS	BUF +1	SAVE MAJOR PART OF QUOTIENT.
2084	REF 234	LAST 1151	00,3440	3 4714 1		CAF	ZERO	FORM MINOR PART OF QUOTIENT USING
2085	REF 191	LAST 1144	00,3441	56 001 0		XCH	L	(REMAINDER,0).
2086			00,3442	0 0006 1		EXTEND		
2087	REF 109	LAST 1152	00,3443	10 130 1		DV	BUF	
2088	REF 192	LAST 1152	00,3444	54 001 1		TS	L	IN PREPARATION FOR DAS.
2089	REF 110	LAST 1152	00,3445	3 0131 1		CA	BUF +1	
2090	REF 587	LAST 1152	00,3446	20 155 1		DAS	MPAC	X2 = X1/2 + (MPAC/2)X1
2091			00,3447	0 0006 1		EXTEND		OVERFLOWS IF ARG. NEAR POSMAX.
2092	REF 1		00,3450	1 3454 0		BZF	TCQBNK00	
2093	REF 34	LAST 1137	00,3451	3 4672 0		CAF	POSMAX	
2094	REF 588	LAST 1152	00,3452	54 154 0	FIXROOT	TS	MPAC	
2095	REF 589	LAST 1152	00,3453	54 155 1		TS	MPAC +1	
2096	REF 269	LAST 1151	00,3454	0 0002 0	TCQBNK00	TC	Q	RETURN TO CALLER TO UNNORMALIZE, ETC.

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2097  REF   6  LAST  989   00,3455  6 4676 1  SRTEST   AD      QUARTER     ARGUMENT WAS LESS THAN .5, SEE IF LESS
2098                       00,3456  0 0006 1           EXTEND              THAN .25.
2099  REF   1              00,3457  6 3501 0           BZMF    SQRTNORM    IF SO, BEGIN NORMALIZATION.

2100  REF 550  LAST 1152   00,3460  52 155 1           DXCH    MPAC        IF BETWEEN .5 AND .25, SHIFT RIGHT 1 AND
2101  REF  27  LAST 1152   00,3461  22 021 1           LXCH    SR          START AT ARGLO.
2102                       00,3462  0 0006 1           EXTEND
2103  REF  19  LAST 1152   00,3463  7 4675 0           MP      HALF
2104  REF 551  LAST 1153   00,3464  52 155 1           DXCH    MPAC
2105  REF  28  LAST 1153   00,3465  56 021 1           XCH     SR
2106  REF 552  LAST 1153   00,3466  26 155 1           ADS     MPAC +1     NO OVERFLOW.

2107  REF   1              00,3467  3 3007 0  ARGLO    CAF     SLOPELO     (NORMALIZED) ARGUMENT BETWEEN .125 AND
2108                       00,3470  0 0006 1           EXTEND              .25
2109  REF 553  LAST 1153   00,3471  7 0154 0           MP      MPAC
2110  REF   1              00,3472  6 2270 0           AD      BIASLO
2111  REF   1              00,3473  1 3422 1           TCF     ARGHI +4    BEGIN SQUARE ROOT.

2112                       00,3474  0 0006 1  SQRTNM2  EXTEND              SHIFT LEFT 2 AND INCREMENT RIGHT SHIFT
2113  REF 554  LAST 1153   00,3475  3 0156 0           DCA     MPAC +1     COUNT (FOR TERMINAL UNNORMALIZATION).
2114  REF 555  LAST 1153   00,3476  20 156 1           DAS     MPAC +1
2115  REF 556  LAST 1153   00,3477  6 0154 1           AD      MPAC
2116  REF 557  LAST 1153   00,3500  26 154 0           ADS     MPAC        (NO OVERFLOW).

2117  REF  61  LAST 1151   00,3501  24 135 0  SQRTNORM INCR    MPTEMP      FIRST TIME THROUGH, JUST SHIFT LEFT 1
2118                       00,3502  0 0006 1           EXTEND              (PUTS IN EFFECTIVE RIGHT SHIFT SINCE
2119  REF 558  LAST 1153   00,3503  3 0156 0           DCA     MPAC +1     WE WANT MPAC/2).
2120  REF 559  LAST 1153   00,3504  20 156 1           DAS     MPAC +1
2121  REF 560  LAST 1153   00,3505  6 0154 1           AD      MPAC
2122  REF 561  LAST 1153   00,3506  26 154 0           ADS     MPAC        (AGAIN NO OVERFLOW).
2123                       00,3507  6 0000 1           DOUBLE
2124  REF  19  LAST  371   00,3510  54 022 0           TS      CYL

2125  REF  20  LAST 1153   00,3511  10 022 0  NORMTEST CCS     CYL         SEE IF ARGUMENT NOW NORMALIZED AT
2126  REF  21  LAST 1153   00,3512  10 022 0           CCS     CYL         GREATER THAN .125.
2127  REF   1              00,3513  1 3474 1           TCF     SQRTNM2     NO - SHIFT LEFT 2 MORE AND TRY AGAIN.
2128  REF   2  LAST 1153   00,3514  1 3416 0           TCF     ARGHI       YES - NOW BETWEEN .5 AND .25.
2129  REF   1              00,3515  1 3467 0           TCF     ARGLO       ARGUMENT NOW BETWEEN .25 AND .125.
```

P2130 TRIGONOMETRIC FUNCTION PACKAGE.

R2131 THE FOLLOWING TRIGONOMETRIC FUNCTIONS ARE AVAILABLE AS INTERPRETIVE OPERATIONS:

R2133 1. SIN COMPUTES (1/2)SINE(2 PI MPAC).
R2134 2. COS COMPUTES (1/2)COSINE(2 PI MPAC).

R2135 3. ASIN COMPUTES (1/2PI)ARCSINE(2 MPAC).
R2136 4. ACOS COMPUTES (1/2PI)ARCCOSINE(2 MPAC).

R2137 SIN-ASIN AND COS-ACOS ARE MUTUALLY INVERSE, IE SIN(ASIN(X)) = X.

```
 2138  REF   4  LAST 1148   00,3516  0 6672 1  COSINE   TC      BRANCH     FINDS COSINE USING THE IDENTITY
 2139                       00,3517  1 3522 C           TCF     +3         COS(X) = SIN(PI/2 - ABS(X)).
 2140  REF   1              00,3520  1 3525 1           TCF     PRESINE
 2141  REF   2  LAST 1154   00,3521  1 3525 1           TCF     PRESINE

 2142                       00,3522  0 0006 1  +3       EXTEND
 2143  REF 602  LAST 1153   00,3523  4 0155 1           DCS     MPAC
 2144  REF 603  LAST 1154   00,3524  52 155 1           DXCH    MPAC

 2145  REF   7  LAST 1153   00,3525  3 4676 1  PRESINE  CAF     QUARTER    PI/2 SCALED.
 2146  REF 604  LAST 1154   00,3526  26 154 C           ADS     MPAC

 2147  REF 605  LAST 1154   00,3527  52 155 1  SINE     DXCH    MPAC       DOUBLE ARGUMENT.
 2148                       00,3530  20 001 1           DDOUBL
 2149                       00,3531  54 000 C           OVSK               SEE IF OVERFLOW PRESENT.
 2150                       00,3532  1 3535 C           TCF     +3         IF NOT, ARGUMENT OK AS IS.

 2151                       00,3533  0 0006 1           EXTEND             IF SC, WE LOST (OR GAINED) PI, SO
 2152                       00,3534  4 0001 1           DCOM               COMPLEMENT MPAC USING THE IDENTITY
A2153                                                                      SIN(X-(+)PI) = SIN(-X).
 2154  REF 606  LAST 1154   00,3535  52 155 1  +3       DXCH    MPAC
 2155  REF 607  LAST 1154   00,3536  3 0154 1           CA      MPAC       SEE IF ARGUMENT GREATER THAN .5 IN
 2156                       00,3537  6 0000 1           DOUBLE             MAGNITUDE. IF SC, REDUCE IT TO LESS THAN
 2157  REF 193  LAST 1152   00,3540  54 001 1           TS      L          .5 (+-PI/2 SCALED) AS FOLLOWS:
 2158  REF   1              00,3541  1 3552 1           TCF     SN1

 2159  REF 311  LAST 1151   00,3542  50 000 1           INDEX   A          IF POSITIVE, FORM PI - X, IF NEGATIVE
 2160  REF   7  LAST 1049   00,3543  3 4674 C           CAF     NEG1/2 +1  USE -PI - X.
 2161                       00,3544  6 0000 1           DOUBLE
 2162                       00,3545  0 0006 1           EXTEND
 2163  REF 608  LAST 1154   00,3546  60 154 1           SU      MPAC       GUARANTEED NO OVERFLOW.
 2164  REF 609  LAST 1154   00,3547  54 154 C           TS      MPAC
 2165  REF 610  LAST 1154   00,3550  4 0155 1           CS      MPAC +1
 2166  REF 611  LAST 1154   00,3551  54 155 1           TS      MPAC +1
```

```
2167                          00,3552  0 0006 1  SN1     EXTEND                  SET UP TO EVALUATE HASTINGS POLYNOMIAL
2168  REF 612  LAST 1154     00,3553  3 0155 C          DCA     MPAC
2169  REF  17  LAST 1140     00,3554  52 134 C          DXCH    BUF2
2170  REF   5  LAST 1150     00,3555  0 3300 1          TC      DSQSUB          SQUARE MPAC.

2171  REF   5  LAST  846     00,3556  0 7171 1          TC      POLY            EVALUATE FOURTH ORDER POLYNOMIAL.
2172                          00,3557   00003 1         DEC     3
2173                          00,3560   14441 C         2DEC    +.3926990796
2173                          00,3561   37325 1
2174                          00,3562   53250 C         2DEC    -.6459637111
2174                          00,3563   60764 1
2175                          00,3564   12146 1         2DEC    +.318758717
2175                          00,3565   21276 1
2176                          00,3566   75466 1         2DEC    -.074780249
2176                          00,3567   71471 C
2177                          00,3570   00236 C         2DEC    +.009694988
2177                          00,3571   32757 C

2178  REF   1                 00,3572  3 2470 C          CAF     LBUF2           MULTIPLY BY ARGUMENT AND SHIFT LEFT 2.
2179  REF  19  LAST 1116     00,3573  0 7055 C          TC      DMPSUB -1

2180                          00,3574  0 0006 1          EXTEND
2181  REF 613  LAST 1155     00,3575  3 0156 C          DCA     MPAC +1
2182  REF 614  LAST 1155     00,3576  20 156 1          DAS     MPAC +1
2183  REF 615  LAST 1155     00,3577  6 0154 1          AD      MPAC
2184  REF 616  LAST 1155     00,3600  26 154 C          ADS     MPAC            NEITHER SHIFT OVERFLOWS.
2185                          00,3601  0 0006 1          EXTEND
2186  REF 617  LAST 1155     00,3602  3 0156 C          DCA     MPAC +1
2187  REF 618  LAST 1155     00,3603  20 156 1          DAS     MPAC +1
2188  REF 619  LAST 1155     00,3604  6 0154 1          AD      MPAC
2189  REF 620  LAST 1155     00,3605  26 154 C          ADS     MPAC
2190  REF  47  LAST 1149     00,3606  1 6030 C          TCF     DANZIG
```

P2191 ARCSIN/ARCCOS ROUTINE.

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2192  REF   1                 00,3607  3 3630 1  ARCSIN   CAF    LASINEX    COMPUTE ARCSIN BY USING THE IDENTITY
2193                          00,3610  1 3612 0            TCF    +2         ARCSIN(X) = PI/2 - ARCCOS(X).

2194  REF   1                 00,3611  3 3712 0  ARCCOS   CAF    LOANZIG    (EXITS IMMEDIATELY).
2195  REF   1                 00,3612  54 136 1            TS     ESCAPE
2196  REF   5  LAST 1154     00,3613  0 6672 1            TC     BRANCH     TEST SIGN OF INPUT.
2197  REF   1                 00,3614  1 3624 0            TCF    ACOSST     START IMMEDIATELY IF POSITIVE.
2198  REF   1                 00,3615  1 3724 1            TCF    ACOSZERO   ARCCOS(0) = PI/2 = .25.
2199                          00,3616  0 0006 1            EXTEND             IF NEGATIVE, USE THE IDENTITY
2200  REF 621  LAST 1155      00,3617  4 0155 1            DCS    MPAC       ARCCOS(X) = PI - ARCCOS(-X), FORCING
2201  REF 622  LAST 1156      00,3620  52 155 1            DXCH   MPAC       ARGUMENT POSITIVE.
2202  REF   1                 00,3621  3 3727 0            CAF    TCSUBTR    SET EXIT  TO DO ABOVE BEFORE
2203  REF   2  LAST 1156      00,3622  56 136 0            XCH    ESCAPE     ARCSIN/ARCCOS CONSIDERATIONS.
2204  REF   1                 00,3623  54 137 0            TS     ESCAPE2

2205  REF  20  LAST 1153      00,3624  4 4675 0  ACOSST   CS     HALF       TEST MAGNITUDE OF INPUT.
2206  REF 623  LAST 1156      00,3625  6 0154 1            AD     MPAC
2207  REF 312  LAST 1154      00,3626  10 000 0            CCS    A
2208  REF   1                 00,3627  1 3720 0            TCF    ACOSOVF    THIS IS PROBABLY AN OVERFLOW CASE.

2209  REF   1                 00,3630  1 3706 1  LASINEX  TCF    ASINEX

2210  REF   1                 00,3631  1 3641 0            TCF    ACOSST2    NO OVERFLOW - PROCEED.

2211  REF 624  LAST 1156      00,3632  10 155 1            CCS    MPAC +1    IF MAJOR PART IS .5, CALL ANSWER 0
2212  REF 235  LAST 1152      00,3633  3 4714 1            CAF    ZERO       UNLESS MINOR PART NEGATIVE.
2213  REF   1                 00,3634  1 3636 0            TCF    ACOS=0

2214  REF   2  LAST 1156      00,3635  1 3641 0            TCF    ACOSST2

2215  REF 625  LAST 1156      00,3636  54 155 1  ACOS=0   TS     MPAC +1
2216  REF 626  LAST 1156      00,3637  54 154 0            TS     MPAC
2217  REF   3  LAST 1156      00,3640  0 0136 0            TC     ESCAPE

2218                          00,3641  0 0006 1  ACOSST2  EXTEND             NOW THAT ARGUMENT IS IN PROPER RANGE,
2219  REF 627  LAST 1156      00,3642  4 0155 1            DCS    MPAC       BEGIN COMPUTATION. USE HASTINGS
2220  REF  21  LAST 1156      00,3643  6 4675 1            AD     HALF       APPROXIMATION ARCCOS(X) = SQRT(1-X)P(X)
2221  REF 628  LAST 1156      00,3644  52 155 1            DXCH   MPAC       IN A SCALED VERSION WHERE P(X) IS A
2222  REF  18  LAST 1155      00,3645  52 134 0            DXCH   BUF2       SEVENTH ORDER POLYNOMIAL.

2223  REF   3  LAST 1148      00,3646  0 3343 0            TC     SQRTSUB    RETURNS WITH NORMALIZED SQUARE ROOT.

2224  REF  62  LAST 1153      00,3647  10 135 1            CCS    MPTEMP     SEE IF UN-NORMALIZATION REQUIRED.
2225  REF   1                 00,3650  1 3713 0            TCF    ACOSSHR    IF SO.
```

```
2226  REF 629  LAST 1156  00,3651  52 155 1  ACOS3   DXCH   MPAC          SET UP FOR POLYNOMIAL EVALUATION.
2227  REF  19  LAST 1156  00,3652  52 134 C          DXCH   BUF2
2228  REF 630  LAST 1157  00,3653  52 155 1          DXCH   MPAC

2229  REF   6  LAST 1155  00,3654  0 7171 1          TC     POLY
2230                       00,3655   00006 1         DEC    6
2231                       00,3656   13240 C         2DEC   +.353553385     COEFFICIENTS ARE C 2(+1)/PISQRT(2) WHERE
2231                       00,3657   23630 C
2232                       00,3660   74721 C         2DEC*  -.0483017006 B+1*                 I
2232                       00,3661   47775 1
2233                       00,3662   02440 C         2DEC*  +.0200273085 B+2*    WHERE C STANDS FOR ORIGINAL COEFFS.
2233                       00,3663   20237 C
2234                       00,3664   75067 1         2DEC*  -.0112931863 B+3*
2234                       00,3665   70742 1
2235                       00,3666   03436 C         2DEC*  +.00695311612 B+4*
2235                       00,3667   26756 1
2236                       00,3670   74037 C         2DEC*  -.00384617957 B+5*
2236                       00,3671   57640 1
2237                       00,3672   03046 C         2DEC*  +.001501297736 B+6*
2237                       00,3673   07143 C
2238                       00,3674   76654 1         2DEC*  -.000284160334 B+7*
2238                       00,3675   42244 C

2239  REF   2  LAST 1155  00,3676  3 2470 C          CAF    LBUF2          DO FINAL MULTIPLY AND GO TO ANY
2240  REF  20  LAST 1155  00,3677  0 7055 C          TC     DMPSUB -1      EPILOGUE SEQUENCES.
2241  REF   4  LAST 1156  00,3700  0 0136 C          TC     ESCAPE

2242                       00,3701  0 0006 1  SUBTR   EXTEND               EPILOGUE FOR NEGATIVE INPUTS TO ARCCOS.
2243  REF 631  LAST 1157  00,3702  4 0155 1          DCS    MPAC
2244  REF  22  LAST 1156  00,3703  6 4675 1          AD     HALF           FORMS PI - ARCCOS(-X) = ARCCOS(X).
2245  REF 632  LAST 1157  00,3704  52 155 1          DXCH   MPAC
2246  REF   2  LAST 1156  00,3705  0 0137 1          TC     ESCAPE2        GO TO POSSIBLE ARCSIN EPILOGUE.

2247                       00,3706  0 0006 1  ASINEX   EXTEND
2248  REF 633  LAST 1157  00,3707  4 0155 1          DCS    MPAC           ARCSIN EPILOGUE - GET ARCSIN(X)
2249  REF   8  LAST 1154  00,3710  6 4676 1          AD     QUARTER        = PI/2 - ARCCOS(X).
2250  REF 634  LAST 1157  00,3711  52 155 1          DXCH   MPAC
2251  REF  48  LAST 1155  00,3712  1 6030 C  LDANZIG  TCF    DANZIG
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2252   REF 313  LAST 1156   00,3713  50 000 1  ACOSSHR  INDEX  A          THE SHIFT RIGHT IS LESS THAN 14 SINCE
2253   REF  68  LAST 1145   00,3714  3 4675 1           CAF    BIT14      THE INPUT WAS NON-ZERO DP.
2254   REF  63  LAST 1156   00,3715  54 135 1           TS     MPTEMP
2255   REF   4  LAST 1122   00,3716  0 2073 1           TC     VSHRRND    DP SHIFT RIGHT AND ROUND.
2256   REF   1              00,3717  1 3651 1           TCF    ACOS3      PROCEED.

2257                        00,3720  0 0006 1  ACOSOVF  EXTEND            IF MAJOR PART WAS ONLY 1 MORE THAN .5,
2258   REF   2  LAST 1156   00,3721  1 3636 C           BZF    ACOS=0     CALL ANSWER ZERO.

2259   REF   4  LAST 1151   00,3722  0 5622 1  ACOSABRT TC     POODOO
2260                        00,3723   01301 1           OCT    1301

2261   REF   9  LAST 1157   00,3724  3 4676 1  ACOSZERO CAF    QUARTER    ACOS(0) = PI/2.
2262   REF   3  LAST 1158   00,3725  1 3637 1           TCF    ACOS=0 +1  SET MPAC AND EXIT VIA ESCAPE.

2263                        00,3726   77763 C  NEG12    DEC    -12
2264   REF   1              00,3727  1 3701 C  TCSUBTR  TCF    SUBTR
```

P2265 THE FOLLOWING INSTRUCTIONS ARE AVAILABLE FOR SETTING, MODIFYING, AND BRANCHING ON INDEX REGISTERS:

R2267 1. AXT ADDRESS TO INDEX TRUE.
R2268 1. AXC ADDRESS TO INDEX COMPLEMENTED.
R2269 3. LXA LOAD INDEX FROM ERASABLE.
R2270 4. LXC LOAD INDEX COMPLEMENTED FROM ERASABLE.
R2271 5. SXA STORE INDEX IN ERASABLE.
R2272 6. XCHX EXCHANGE INDEX REIGSTER WITH ERASABLE.

R2273 7. INCR INCREMENT INDEX REGISTER.
R2274 8. XAD ERASABLE ADD TO INDEX REGISTER.
R2275 9. XSU ERASABLE SUBTRACT FROM INDEX REGISTER.

R2276 10. TIX BRANCH ON INDEX REGISTER AND DECREMENT.

```
2277                        01,2371                 BANK   01

2278  REF   1                                      COUNT  01/INTER

2279  REF   1               01,2371  0 2466 1  AXT  TC     TAGSUB     SELECT APPROPRIATE INDEX REGISTER.
2280  REF  22  LAST 1149    01,2372  3 0117 C       CA     POLISH
2281  REF   4  LAST 1078    01,2373  50 130 0  XSTORE INDEX  INDEXLOC  CONTAINS C(FIXLOC) OR C(FIXLOC)+1.
2282  REF  50  LAST 1088    01,2374  54 046 1       TS     X1
2283  REF  49  LAST 1157    01,2375  1 6030 C       TCF    DANZIG

2284  REF   2  LAST 1159    01,2376  0 2466 1  AXC  TC     TAGSUB
2285  REF  23  LAST 1159    01,2377  4 0117 1       CS     POLISH
2286  REF   1               01,2400  0 2373 1       TC     XSTORE

2287  REF   1               01,2401  0 2454 C  LXA  TC     15ADRERS   LOAD INDEX REGISTER FROM ERASABLE.
2288  REF  24  LAST 1159    01,2402  50 117 C       INDEX  POLISH
2289                        01,2403  3 0000 1       CA     0
2290  REF   2  LAST 1159    01,2404  1 2373 C       TCF    XSTORE

2291  REF   2  LAST 1159    01,2405  0 2454 C  LXC  TC     15ADRERS   LOAD NDX REG FROM ERASABLE COMPLEMENTED.
2292  REF  25  LAST 1159    01,2406  50 117 0       INDEX  POLISH
2293                        01,2407  4 0000 0       CS     0
2294  REF   3  LAST 1159    01,2410  1 2373 C       TCF    XSTORE

2295  REF   3  LAST 1159    01,2411  0 2454 C  SXA  TC     15ADRERS   STORE INDEX REGISTER IN ERASABLE.
2296  REF   5  LAST 1159    01,2412  50 130 0       INDEX  INDEXLOC
2297  REF  51  LAST 1159    01,2413  3 0046 C       CA     X1
2298  REF  26  LAST 1159    01,2414  50 117 C  MSTORE1 INDEX  POLISH
2299                        01,2415  54 000 C       TS     0
2300  REF  50  LAST 1159    01,2416  1 6030 C       TCF    DANZIG
```

```
2301  REF   4  LAST 1159  01,2417  0 2454 C  XCHX   TC     15ADRERS   EXCHANGE INDEX REGISTER WITH ERASABLE.
2302  REF  27  LAST 1159  01,2420  50 117 C         INDEX  POLISH
2303               01,2421  3 0000 1         CA     0
2304  REF   6  LAST 1159  01,2422  5C 130 C         INDEX  INDEXLCC
2305  REF  52  LAST 1159  01,2423  56 046 C         XCH    X1
2306  REF   1             01,2424  1 2414 C         TCF    MSTORE1

2307  REF   5  LAST 116C  01,2425  0 2454 C  XAD    TC     15ADRERS   ADD ERASABLE TO INDEX REGISTER.
2308  REF  28  LAST 116C  01,2426  50 117 C         INDEX  POLISH
2309               01,2427  3 0000 1         CA     0
2310  REF   7  LAST 116C  01,2430  5C 130 C  XAD2   INDEX  INDEXLCC
2311  REF  53  LAST 116C  01,2431  26 046 1         ADS    X1         IGNORING OVERFLOWS.
2312  REF  51  LAST 1159  01,2432  1 6030 C         TCF    DANZIG

2313  REF   3  LAST 1159  01,2433  0 2466 1  INCR   TC     TAGSUB     INCREMENT INDEX REGISTER.
2314  REF  29  LAST 116C  01,2434  3 0117 C         CA     POLISH
2315  REF   1             01,2435  1 2430 C         TCF    XAD2

2316  REF   6  LAST 116C  01,2436  0 2454 C  XSU    TC     15ADRERS   SUBTRACT ERASABLE FROM INDEX REGISTER.
2317  REF  30  LAST 116C  01,2437  5C 117 C         INDEX  POLISH
2318               01,2440  4 0000 C         CS     0
2319  REF   2  LAST 116C  01,2441  1 2430 C         TCF    XAD2

2320  REF   4  LAST 116C  01,2442  0 2466 1  TIX    TC     TAGSUB     BRANCH AND DECREMENT ON INDEX.
2321  REF   8  LAST 116C  01,2443  50 130 C         INDEX  INDEXLOC
2322  REF  37  LAST  888  01,2444  4 0050 C         CS     S1
2323  REF   9  LAST 116C  01,2445  5C 130 C         INDEX  INDEXLCC
2324  REF  54  LAST 116C  01,2446  6 0046 C         AD     X1
2325               01,2447  0 0006 1         EXTEND                    NO OPERATION IF DECREMENTED INDEX IS
2326  REF  52  LAST 116C  01,2450  6 6030 1         BZMF   DANZIG     NEGATIVE OR ZERO.

2327  REF  10  LAST 116C  01,2451  50 130 C  DOTIXBR INDEX  INDEXLOC
2328  REF  55  LAST 116C  01,2452  56 046 C         XCH    X1         IGNORING OVERFLOWS.

2329  REF   6  LAST 1149  01,2453  1 6615 1         TCF    GOTO       DO THE BRANCH USING THE CADR IN POLISH.
```

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P2330           SUBROUTINE TO CONVERT AN ERASABLE ADDRESS (11 BITS) TO AN EBANK SETTING AND SUBADDRESS.

 2332  REF  31  LAST 116C  01,2454  4 0117 1  15ADRES5 CS    POLISH
 2333  REF   3  LAST 1088  01,2455  6 4727 1            AD    DEC45
 2334  REF 314  LAST 1158  01,2456  10 000 C            CCS   A          DOES THE ADDRESS POINT TO THE WORK AREA?
 2335  REF  31  LAST 1145  01,2457  3 0120 1            CA    FIXLOC     YES.  ADD FIXLOC.  EBANK OK AS IS.
 2336                      01,2460  1 2465 C            TCF   +5

 2337  REF   6  LAST 1088  01,2461  3 4744 1            CA    OCT1400    NO.  SET EBANK & MAKE UP SUBADDRESS.
 2338  REF  32  LAST 1161  01,2462  56 117 C            XCH   POLISH
 2339  REF  5C  LAST 1096  01,2463  54 003 C            TS    EBANK
 2340  REF  12  LAST 1096  01,2464  7 4373 C            MASK  LOW8
 2341  REF  33  LAST 1161  01,2465  26 117 1  +5        ADS   POLISH     FALL INTO TAGSUB, AND RETURN VIA Q.

R2342           SUBROUTINE WHICH SETS THE ADDRESS OF THE SPECIFIED INDEX IN INDEXLOC. (ACTUALLY, THE ADDRESS -380.)

 2344  REF  32  LAST 1161  01,2466  3 0120 1  TAGSUB   CA    FIXLOC
 2345  REF  11  LAST 116C  01,2467  54 130 1            TS    INDEXLOC

 2346  REF  36  LAST 1128  01,2470  10 020 1            CCS   CYR        BIT 15 SPECIFIES INDEX.
 2347  REF  12  LAST 1161  01,2471  24 130 C            INCR  INDEXLOC   0 MEANS USE X2.
 2348  REF 270  LAST 1152  01,2472  0 0002 C            TC    Q
 2349  REF 271  LAST 1161  01,2473  0 0002 C            TC    Q          1 FOR X1.
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P2350           MISCELLANEOUS OPERATION CODES WITH DIRECT ADDRESSES. INCLUDED HERE ARE:

R2352           1. ITA                  STORE QPRET (RETURN ADDRESS) IN ERASABLE.
R2354           2. CALL                 CALL A SUBROUTINE, LEAVING RETURN IN QPRET.
R2356           3. RTB                  RETURN TO BASIC LANGUAGE AT THE GIVEN ADDRESS.
R2358           4. BHIZ                 BRANCH IF THE HIGH ORDER OF MPAC IS ZERO (SINGLE PRECISION).
R2360           5. BOV                  BRANCH ON OVERFLOW.
R2361           6. GOTO                 SIMPLE SEQUENCE CHANGE.

 2362   REF  37  LAST 1161   01,2474  10 020 1  RTB/BHIZ CCS     CYR
 2363   REF  34  LAST 1161   01,2475  3 0117 C  RTB       CA      POLISH
 2364   REF   5  LAST  728   01,2476  0 4560 C            TC      SWCALL   -1     SO A "TC Q" FROM ROUTINE LEADS TO DANZIG

 2365   REF 635  LAST 1157   01,2477  10 154 C  BHIZ      CCS     MPAC
 2366   REF  53  LAST 116C   01,2500  1 6030 C            TCF     DANZIG
 2367   REF   7  LAST 116C   01,2501  1 6615 1            TCF     GOTO
 2368   REF  54  LAST 1162   01,2502  1 6030 C            TCF     DANZIG
 2369   REF   8  LAST 1162   01,2503  1 6615 1            TCF     GOTO

 2370   REF   9  LAST 115C   01,2504  10 121 1  BOV(8)    CCS     OVFIND          BRANCH ON OVERFLOW TO BASIC OR INTERP.
 2371                        01,2505  1 2507 C            TCF     +2
 2372   REF  55  LAST 1162   01,2506  1 6030 C            TCF     DANZIG
 2373   REF  10  LAST 1162   01,2507  54 121 1            TS      OVFIND
 2374   REF  38  LAST 1162   01,2510  10 020 1            CCS     CYR
 2375   REF   1              01,2511  1 2475 1            TCF     RTB             IF BASIC.
 2376                        01,2512   C0360 1  85TCB8    OCT     360
 2377   REF   9  LAST 1162   01,2513  1 6615 1            TCF     GOTO
```

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2378   REF  39  LAST 1162   01,2514  10 020 1  BZE/GOTO CCS    CYR       SEE WHICH OP-CODE IS DESIRED.
2379   REF   6  LAST 1156   01,2515  0 6672 1              TC     BRANCH    DO BZE.
2380   REF  56  LAST 1162   01,2516  1 6030 C              TCF    DANZIG
2381   REF  10  LAST 1162   01,2517  1 6615 1              TCF    GOTO      DO GOTO.
2382   REF  57  LAST 1163   01,2520  1 6030 C              TCF    DANZIG

2383   REF  40  LAST 1163   01,2521  10 020 1  BPL/BMN   CCS    CYR
2384   REF   1              01,2522  1 2530 1              TCF    BPL
2385                        01,2523   12000 1  5B10      DEC    5 B+10    SHIFTS OP CODE IN SWITCH INSTRUCTION ADR

2386   REF   7  LAST 1163   01,2524  0 6672 1              TC     BRANCH    DO BMN.
2387   REF  58  LAST 1163   01,2525  1 6030 C              TCF    DANZIG
2388   REF  59  LAST 1163   01,2526  1 6030 C              TCF    DANZIG
2389   REF  11  LAST 1163   01,2527  1 6615 1              TCF    GOTO      ONLY IF NNZ.

2390   REF   8  LAST 1163   01,2530  0 6672 1  BPL         TC     BRANCH
2391   REF  12  LAST 1163   01,2531  1 6615 1              TCF    GOTO      IF POSITIVE OR ZERO.
2392   REF  13  LAST 1163   01,2532  1 6615 1              TCF    GOTO
2393   REF  60  LAST 1163   01,2533  1 6030 C              TCF    DANZIG

2394   REF  41  LAST 1163   01,2534  10 020 1  CALL/ITA CCS    CYR
2395   REF   1              01,2535  1 6607 1              TCF    CALL

2396   REF   7  LAST  355   01,2536  0 5642 1              TC     CCSHOLE
2397   REF   7  LAST 116C   01,2537  0 2454 C              TC     15ADRERS  STORE QPRET. (TAGSUB AFTER 15ADRERS IS
2398   REF  33  LAST 1161   01,2540  5C 120 1              INDEX  FIXLOC    SLOW IN THIS CASE, BUT SAVES STORAGE.)
2399   REF  19  LAST 1149   01,2541  3 0052 C              CA     QPRET
2400   REF   2  LAST 116C   01,2542  1 2414 C              TCF    MSTORE1
```

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P2401                THE FOLLOWING OPERATIONS ARE AVAILABLE FOR ALTERING AND TESTING INTERPRETIVE SWITCHES:

R2403   00   BONSET          SET A SWITCH AND DO A GOTO IF IT WAS ON.
R2404   01   SETGO           SET A SWITCH AND DO A GOTO.
R2405   02   BOFSET         SET A SWITCH AND DO A GOTO IF IT WAS OFF
R2406   03   SET            SET A SWITCH.

R2407   04   BONINV         INVERT A SWITCH AND BRANCH IF IT WAS ON.
R2408   05   INVGO          INVERT A SWITCH AND DO A GOTO.
R2409   06   BOFINV         INVERT A SWITCH AND BRANCH IF IT WAS OFF
R2410   07   INVERT         INVERT A SWITCH.

R2411   10   BONCLR         CLEAR A SWITCH AND BRANCH IF IT WAS ON.
R2412   11   CLRGO          CLEAR A SWITCH AND DO A GOTO.
R2413   12   BOFCLR         CLEAR A SWITCH AND BRANCH IF IT WAS OFF.
R2414   13   CLEAR          CLEAR A SWITCH.

R2415   14   BON            BRANCH IF A SWITCH WAS ON.
R2416   16   BOFF           BRANCH IF A SWITCH WAS OFF.


R2417                THE ADDRESS SUPPLIED WITH THE SWITCH INSTRUCTION IS INTERPRETED AS FOLLOWS:

R2419                BITS 1-4    SWITCH BIT NUMBER (1-15).
R2420                BITS 5-8    SWITCH OPERATION NUMBER.
R2421                BITS 9-     SWITCH WORD NUMBER (UP TO 64 SWITCH WORDS).

R2422                THE ADDRESS ITSELF IS MADE UP BY THE YUL SYSTEM ASSEMBLER. THE BRANCH INSTRUCTIONS REQUIRE TWO
R2424   ADDRESSES, THE SECOND TAKEN AS THE DIRECT (OR INDIRECT IF IN ERASABLE) ADDRESS OF THE BRANCH.


 2426   REF   3  LAST  974   01,2543  3 4721 1  SWITCHES CAF    LOW4          LEAVE THE SWITCH BIT IN  SWBIT  .
 2427   REF  35  LAST 1162   01,2544  7 0117 1           MASK   POLISH
 2428   REF 315  LAST 1161   01,2545  50 000 1           INDEX  A
 2429   REF  46  LAST 1148   01,2546  3 4674 0           CAF    BIT15         (NUMBER FROM LEFT TO RIGHT.)
 2430   REF   1               01,2547  54 131 0           TS     SWBIT

 2431   REF  49  LAST 1064   01,2550  3 4704 0           CAF    BIT7          LEAVE THE SWITCH NUMBER IN SWWORD.
 2432                        01,2551  0 0006 1           EXTEND
 2433   REF  36  LAST 1164   01,2552  7 0117 1           MP     POLISH
 2434   REF   1               01,2553  54 130 1           TS     SWWORD

 2435                        01,2554  0 0004 0           INHINT                DURING SWITCH CHANGE SO RUPT CAN USE TOO
 2436   REF 316  LAST 1164   01,2555  50 000 1           INDEX  A              LEAVE THE SWITCH WORD ITSELF IN L.
 2437   REF  49  LAST  795   01,2556  3 0074 1           CA     STATE
 2438   REF 272  LAST 1161   01,2557  54 002 1           TS     Q              Q WILL BE USED AS A CHANNEL.
```

```
2439   REF  30  LAST 1034   01,2560  3 4700 1          CAF     BIT11
2440                        01,2561  0 0006 1          EXTEND                  DISPATCH SWITCH BIT OPERATION AS IN BITS
2441   REF  37  LAST 1164   01,2562  7 0117 1          MP      POLISH          7-8 OF POLISH.
2442   REF   1              01,2563  7 2623 0          MASK    B3TO84          GETS 4X2-BIT CODE.
2443   REF 317  LAST 1164   01,2564  50 000 1          INDEX   A
2444                        01,2565  1 2566 1          TCF     +1

2445   REF   2  LAST 1164   01,2566  3 0131 1  +1      CA      SWBIT           00 - SET SWITCH IN QUESTION.
2446                        01,2567  0 0006 1          EXTEND
2447   REF   1              01,2570  04 002 1          ROR     QCHAN
2448   REF   1              01,2571  1 2600 1          TCF     SWSTORE

2449   REF   3  LAST 1165   01,2572  3 0131 1  +5      CA      SWBIT           01 - INVERT SWITCH.
2450                        01,2573  0 0006 1          EXTEND
2451   REF   2  LAST 1165   01,2574  06 002 0          RXOR    QCHAN
2452   REF   2  LAST 1165   01,2575  1 2600 1          TCF     SWSTORE

2453   REF   4  LAST 1165   01,2576  4 0131 0  +9D      CS      SWBIT           10 - CLEAR.
2454   REF 273  LAST 1164   01,2577  7 0002 1          MASK    Q
2455   REF   2  LAST 1164   01,2600  50 130 0  SWSTORE  INDEX   SWWORD
2456   REF  50  LAST 1164   01,2601  54 074 0          TS      STATE           NEW SWITCH WORD.
```

```
2457                          01,2602  0 0003 1   +13D    RELINT                  11 - NOOP.
2458  REF  41  LAST 1001     01,2603  3 4676 1           CAF    BIT13
2459                          01,2604  0 0006 1           EXTEND                  DISPATCH SEQUCE CHANGING OR BRANCHING
2460  REF  38  LAST 1165     01,2605  7 0117 1           MP     POLISH           CODE.
2461  REF   2  LAST 1165     01,2606  7 2623 0           MASK   B3TOB4
2462  REF 318  LAST 1165     01,2607  5C 000 1           INDEX  A
2463                          01,2610  1 2611 1           TCF    +1               ORIGINALLY STORED IN BITS 5-6.

2464  REF 274  LAST 1165     01,2611  4 0002 1   +1      CS     Q                00 - BRANCH IF ON.
2465  REF   5  LAST 1165     01,2612  7 0131 0   TEST    MASK   SWBIT
2466  REF 319  LAST 1166     01,2613  10 000 C           CCS    A
2467  REF   1                01,2614  1 2624 1           TCF    SWSKIP

2468  REF   1                01,2615  1 6664 1   +5      TCF    SWBRANCH         01 - GO TO.

2469  REF   2  LAST 1166     01,2616  1 2624 1           TCF    SWSKIP           HERE ONLY ON BIT 15.

2470  REF   8  LAST 1163     01,2617  0 5642 1           TC     CCSHOLE
2471  REF   9  LAST 1166     01,2620  0 5642 1           TC     CCSHOLE

2472  REF 275  LAST 1166     01,2621  3 0002 0   +9D     CA     Q                10 - BRANCH IF OFF.
2473  REF   1                01,2622  1 2612 1           TCF    TEST

2474                          01,2623   00014 1  B3TOB4  OCT    0014
2475  REF  27  LAST 1097     01,2624  24 164 1   SWSKIP  INCR   LOC
2476  REF   1                01,2543            SW/     EQUALS SWITCHES
2477  REF  61  LAST 1163     01,2625  1 6030 0   +13D    TCF    DANZIG           11 - NOOP.
```

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```
 0001                          4671                    BLOCK  02

 00015  REF   1                                        COUNT  02/FCONS

R00016   THE FOLLOWING TABLE OF 18 VALUES IS INDEXED. DO NOT INSERT OR REMOVE ANY QUANTITIES.

 0002                          4671   37777 1  DPOSMAX  OCT    37777          MUST PRECEDE POSMAX
 0003                          4672   37777 1  POSMAX   OCT    37777

 0004   REF   8  LAST 1154     4673            LIMITS   =      NEG1/2

 0007                          4673   57777 1  NEG1/2   OCT    -20000         USED BY SIN ROUTINE (MUST BE TWO
A0008                                                                        LOCATIONS IN FRONT OF BIT14)
R0009           BIT TABLE

 0010                          4674   40000 0  BIT15    OCT    40000
 0011                          4675   20000 0  BIT14    OCT    20000
 0012                          4676   10000 0  BIT13    OCT    10000
 0013                          4677   04000 0  BIT12    OCT    04000
 0014                          4700   02000 0  BIT11    OCT    02000
 0015                          4701   01000 0  BIT10    OCT    01000
 0016                          4702   00400 0  BIT9     OCT    00400
 0017                          4703   00200 0  BIT8     OCT    00200
 0018                          4704   00100 0  BIT7     OCT    00100
 0019                          4705   00040 0  BIT6     OCT    00040
 0020                          4706   00020 0  BIT5     OCT    00020
 0021                          4707   00010 0  BIT4     OCT    00010
 0022                          4710   00004 0  BIT3     OCT    00004
 0023                          4711   00002 0  BIT2     OCT    00002
 0024                          4712   00001 0  BIT1     OCT    00001


R0025   DO NOT DESTROY THIS COMBINATION, SINCE IT IS USED IN DOUBLE PRECISION INSTRUCTIONS.
 0027                          4713   77777 0  NEG0     OCT    -0             MUST PRECEDE ZERO
 0028                          4714   00000 1  ZERO     OCT    0              MUST FOLLOW NEG0
A0029                                         BIT1     OCT    00001
A0030                                         NO.WDS   OCT    2              INTERPRETER
A0031                                         OCTAL3   OCT    3              INTERPRETER
A0032                                         R3D1     OCT    4              PINBALL
 0033                          4715   00005 1  FIVE     OCT    5
A0034                                         REVCNT   OCT    6              INTERPRETER
 0035                          4716   00007 0  SEVEN    OCT    7
A0036                                         BIT4     OCT    00010
A0037                                         R2D1     OCT    11             PINBALL
 00375  REF   6  LAST  367     4334            OCT11    =      R2D1           P20S
A0038                                         BINCON   DEC    10             PINBALL          (OCTAL 12)
 0039                          4717   00013 0  ELEVEN   DEC    11
A0040                                         OCT14    OCT    14             ALARM AND ABORT (FILLER)
 00401                         4720   00015 0  OCT15    OCT    15
A0041                                         R1D1     OCT    16             PINBALL
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 0043                    4721   00017 1  LOW4     OCT    17
A0044                                    BIT5     OCT    00020
A0045                                    ND1      OCT    21          PINBALL
A0046                                    VD1      OCT    23          PINBALL
A0047                                    OCT24    OCT    24          SERVICE ROUTINES
A0048                                    MD1      OCT    25          PINBALL
 00485                  4722   00030 1  BITS4&5  OCT    30
A0049                                    OCT31    OCT    31          SERVICE ROUTINES
 0050                   4723   00032 0  CALLCODE OCT    00032
A0051                                    LOW5     OCT    37          PINBALL
A0052                                    33DEC    DEC    33          PINBALL              (OCTAL 41)
A0053                                    34DEC    DEC    34          PINBALL              (OCTAL 42)
 0054                   4724   00045 0  TBUILDFX DEC    37          BUILDUP FOR CONVIENCE IN DAPTESTING
 0055                   4725   00046 0  TDECAYFX DEC    38          CONVENIENCE FOR DAPTESTING
A0056                                    BIT6     OCT    00040
 0057                   4726   00050 1  OCT50    OCT    50
 0058                   4727   00055 1  DEC45    DEC    45
 0059                   4730   00060 1  SUPER011 OCT    60          BITS FOR SUPERBNK SETTING 011.
 0060                   4731   00062 0  .5SEC    DEC    50
A0061                                    BIT7     OCT    00100

 0062  REF  SC  LAST 1164      4704             SUPER100 =      BIT7        BITS FOR SUPERBNK SETTING 100
A0063                                                                      (LAST 4K OF ROPE)
 0064                   4732   00120 1  SUPER101 OCT    120         BITS FOR SUPERBNK SETTING 101
A0065                                    OCT121   OCT    121         SERVICE ROUTINES
A0066                                                                      (FIRST 8K OF ACM)
 0067                   4733   00140 1  SUPER110 OCT    140         BITS FOR SUPERBNK SETTING 110.
A0068                                                                      (LAST 8K OF ACM)
 0069                   4734   00144 0  1SEC     DEC    100
A0070                                    LOW7     OCT    177         INTERPRETER
A0071                                    BIT8     OCT    00200
A0072                                    OT215    OCT    215         ALARM AND ABORT
A0073                                    8,5      OCT    00220       P20-P25 SUNDANCE
 0074                   4735   00310 0  2SECS    DEC    200
A0075                                    LOW8     OCT    377         PINBALL
A0076                                    BIT9     OCT    00400
 0077                   4736   00401 1  GN/CCODE OCT    00401       SET S/C CONTROL SWITCH TO G/N
 0079                   4737   00454 1  3SECS    DEC    300
 0080                   4740   00620 0  4SECS    DEC    400
 00801                  4741   00777 0  LOW9     OCT    777
A0081                                    BIT10    OCT    01000
A0082                                    5.5DEGS  DEC    .03056      P20-P25 SUNDANCE     (OCTAL 00765)
A0083                                    OCT1103  OCT    1103        ALARM AND ABORT
 0084                   4742   01124 1  C5/2     DEC    .0363551                         (OCTAL 01124)
 0085                   4743   01211 1  V05N09   VN     0509        (SAME AS OCTAL 1211)
 0086                   4744   01400 1  OCT1400  OCT    01400
 00865                  4745   01426 0  V06N22   VN     0622
A0087                                    MID5     OCT    1740        PINBALL
 00875                  4746   01776 0  BITS2-10 OCT    1776
 0088                   4747   01777 1  LOW10    OCT    1777
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A0089                                  BIT11   OCT     02000
A0090                                  2K+3    OCT     2003        PINBALL
 0091           4750    02177 1        LOW7+2K OCT     2177        OP CODE MASK + BANK I FBANK SETTING.
 0092           4751    02400 1        EBANK5  OCT     02400
 0093           4752    03000 1        PRIO3   OCT     03000
 0094           4753    03400 0        EBANK7  OCT     03400
A0095                                  LOW11   OCT     3777        PINBALL
A0096                                  BIT12   OCT     04000
A0097                                  RELTAB  OCT     04025       T4RUPT
 0098           4754    05000 1        PRIO5   OCT     05000
 0099           4755    06000 1        PRIO6   OCT     06000
 0100           4756    07000 0        PRIO7   OCT     07000

A0102                                  BIT13   OCT     10000
A0103                                          OCT     10003       T4RUPT      RELTAB +1D
A0104                                  13,7,2  OCT     10102       P20-P25 SUNDANCE
 0105           4757    11000 1        PRIO11  OCT     11000
A0106                                  PRIO12  OCT     12000       BANKCALL
 0107           4760    13000 0        PRIO13  OCT     13000
 0108           4761    14000 1        PRIO14  OCT     14000
A0109                                          OCT     14031       T4RUPT      RELTAB +2D
 0110           4762    15000 0        PRIO15  OCT     15000
 0111           4763    16000 0        PRIO16  OCT     16000
A0112                                  85DEGS  DEC     .45556      P20-P25 SUNDANCE    (OCTAL 16450)
 0113           4764    17000 1        PRIO17  OCT     17000
 0114           4765    17770 1        OCT17770 OCT    17770
A0115                                  BIT14   OCT     20000
A0116                                          OCT     20033       T4RUPT      RELTAB +3D
 0117           4766    21000 1        PRIO21  OCT     21000
01175           7657                           BLOCK   03
01176 REF   1                                  COUNT   03/FCONS

 0118           7657    22000 1        PRIO22  OCT     22000       SERVICE ROUTINES
 0119           7660    23000 0        PRIO23  OCT     23000
 0120           7661    24000 1        PRIO24  OCT     24000
A0121                                  5/8+1   OCT     24001       SINGLE PRECISION SUBROUTINES
A0122                                          OCT     24017       T4RUPT      RELTAB +4D
 0123           7662    25000 0        PRIO25  OCT     25000
 0124           7663    26000 0        PRIO26  OCT     26000
 0125           7664    27000 1        PRIO27  OCT     27000
A0126                                  CHRPRIO OCT     30000       PINBALL
A0127                                          OCT     30036       T4RUPT      RELTAB +5D
 0128           7665    31000 0        PRIO31  OCT     31000
 0129           7666    31103 1        C1/2    DEC     .7853134                        (OCTAL 31103)
 0130           7667    32000 0        PRIO32  OCT     32000
 0131           7670    33000 1        PRIO33  OCT     33000
 0132           7671    34000 0        PRIO34  OCT     34000
A0133                                          OCT     34034       T4RUPT      RELTAB +6D
 0134           7672    35000 1        PRIO35  OCT     35000
 0135           7673    36000 1        PRIO36  OCT     36000
```

0136	7674	37000	C	PRIO37	OCT	37000	
0137	7675	37401	C	63/64+1	OCT	37401	
A0138				MID7	OCT	37600	PINBALL
0139	7676	37766	1	OCT37766	OCT	37766	
0140	7677	37774	1	OCT37774	OCT	37774	
0141	7700	37776	C	OCT37776	OCT	37776	
A01411				DPOSMAX	OCT	37777	
A0142				BIT15	OCT	40000	
A0143				OCT40001	OCT	40001	INTERPRETER (CS 1 INSTRUCTION)
0144	7701	40014	C	DLOADCOD	OCT	40014	
0145	7702	40015	1	DLOAD*	OCT	40015	
A0146					OCT	40023	T4RUPT RELTAB +7D
01465	7703	40040	1	BIT15+6	OCT	40040	
01466	7704	40200	1	OCT40200	OCT	40200	
A0147					OCT	44035	T4RUPT RELTAB +8D
A0148					OCT	50037	T4RUPT RELTAB +9D
A0149					OCT	54000	T4RUPT RELTAB +10D
01495	7705	57777	1	-BIT14	OCT	57777	
A0150				RELTAB11	OCT	60000	T4RUPT
0151	7706	65552	C	C3/2	DEC	-.3216147	(OCTAL 65552)
0152	7707	70000	C	13,14,15	OCT	70000	
0153	7710	73777	1	-1/8	OCT	73777	
0154	7711	74000	1	HIGH4	OCT	74000	
0155	7712	74056	1	-ENDERAS	DEC	-2001	(OCTAL 74056)
A0156				HI5	OCT	76000	PINBALL
0157	7713	77700	C	HIGH9	OCT	77700	
A0158				-ENDVAC	DEC	-45	INTERPRETER (OCTAL 77722)
A0159				-OCT10	OCT	-10	(OCT 77767)
A0161				NEG4	DEC	-4	(OCTAL 77773)
0162	7714	77774	C	NEG3	DEC	-3	
0163	7715	77775	1	NEG2	OCT	77775	
0164	7716	77776	1	NEGONE	DEC	-1	

PQ165 DEFINED BY EQUALS

RQ166 IT WOULD BE TO THE USERS ADVANTAGE TO OCCASIONALLY CHECK ANY OF THESE SYMBOLS IN ORDER TO PREVENT ANY
RQ168 ACCIDENTAL DEFINITION CHANGES.

0169	REF 5	LAST 328	7716	MINUS1	=	NEG1	
0170	REF 28	LAST 1131	7716	NEG1	=	NEGONE	
0171	REF 75	LAST 1076	4712	ONE	=	BIT1	
0172	REF 43	LAST 1056	4711	TWO	=	BIT2	
0173	REF 1		6214	THREE	=	OCTAL3	
0174	REF 41	LAST 110C	6214	LOW2	=	THREE	
0175	REF 32	LAST 1042	4710	FOUR	=	BIT3	
0176	REF 2	LAST 108C	6211	SIX	=	REVCNT	
0177	REF 17	LAST 1151	4716	LOW3	=	SEVEN	
0178	REF 39	LAST 1048	4707	EIGHT	=	BIT4	
0179	REF 7	LAST 1167	4334	NINE	=	R2D1	
0180	REF 3	LAST 375	4377	TEN	=	BINCON	
0181	REF 9	LAST 1027	4717	NOUTCON	=	ELEVEN	
0182	REF 18	LAST 899	4374	OCT23	=	VD1	
01825	REF 2	LAST 368	4376	OCT25	=	MD1	
0183	REF 37	LAST 1127	4701	PRIO1	=	BIT1C	
0184	REF 7	LAST 1161	4744	EBANK3	=	OCT1400	
0185	REF 31	LAST 1165	4700	PRIO2	=	BIT11	
0186	REF 1		4732	OCT120	=	SUPER101	
0187	REF 1		4733	OCT140	=	SUPER110	
0188	REF 32	LAST 1171	4700	2K	=	BIT11	
0189	REF 33	LAST 1171	4700	EBANK4	=	BIT11	
0190	REF 30	LAST 104C	4677	PRIO4	=	BIT12	
0191	REF 2	LAST 494	4752	EBANK6	=	PRIO3	
0192	REF 42	LAST 1166	4676	QUARTER	=	BIT13	
0193	REF 43	LAST 1171	4676	PRIO10	=	BIT13	
01935	REF 1		7632	OCT10001	=	CCSL	
0194	REF 23	LAST 1157	4675	POS1/2	=	HALF	
0195	REF 69	LAST 115E	4675	PRIO20	=	BIT14	
0196	REF 70	LAST 1171	4675	HALF	=	BIT14	
0197	REF 5	LAST 378	4371	PRIO30	=	CHRPRIO	
0198	REF 14	LAST 1098	4371	BIT13-14	=	PRIO30	INTERPRETER USES IN PROCESSING STORECODE
01985	REF 3	LAST 1083	6440	OCT30002	=	TLOAD +1	
0199	REF 8	LAST 1068	7671	B12T14	=	PRIO34	
0200	REF 47	LAST 1164	4674	NEGMAX	=	BIT15	
0201	REF 48	LAST 1171	4674	VLOADCOD	=	BIT15	
0202	REF 1		6056	VLOAD*	=	OCT40001	
0203	REF 3	LAST 536	4105	OCT60000	=	RELTAB11	
0204	REF 5	LAST 326	4364	BANKMASK	=	HI5	

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0001   REF   1                26,2000                        SETLOC INTPRET1
0002                          26,3321                        BANK

0003   REF   1                                               COUNT  23/ICONS

0004                          26,3321   10000 0  DP1/4TH     2DEC   .25
0004                          26,3322   00000 1
0005                          26,3323   00000 1  UNITZ       2DEC   0
0005                          26,3324   00000 1
0006                          26,3325   00000 1  UNITY       2DEC   0
0006                          26,3326   00000 1
0007                          26,3327   20000 0  UNITX       2DEC   .5
0007                          26,3330   00000 1
0008                          26,3331   00000 1  ZEROVECS    2DEC   0
0008                          26,3332   00000 1
0009                          26,3333   00000 1              2DEC   0
0009                          26,3334   00000 1
0010                          26,3335   00000 1              2DEC   0
0010                          26,3336   00000 1
0011   REF   7 LAST 669       26,3327                DPHALF   =      UNITX
0012                          26,3337   37777 1  DPPOSMAX    OCT    37777
0013                          26,3340   37777 1              OCT    37777
```

P0014 INTERPRETIVE CONSTANTS IN THE OTHER HALF-MEMORY

```
0015  REF  1                 04,2000                        SETLOC INTPRET2
0016                         04,3444                        BANK

0017  REF  1                                                COUNT  14/ICONS

0018                         04,3444  00000 1  ZUNIT       2DEC   0
0018                         04,3445  00000 1
0019                         04,3446  00000 1  YUNIT       2DEC   0
0019                         04,3447  00000 1
0020                         04,3450  20000 0  XUNIT       2DEC   .5
0020                         04,3451  00000 1
0021                         04,3452  00000 1  ZEROVEC     2DEC   0
0021                         04,3453  00000 1
0022                         04,3454  00000 1              2DEC   0
0022                         04,3455  00000 1
0023                         04,3456  00000 1              2DEC   0
0023                         04,3457  00000 1
0024                         04,3460  77777 0              OCT    77777          -0,-6,-12 MUST REMAIN IN THIS ORDER
0025                         04,3461  77771 0  DEC-6        DEC    -6
0026                         04,3462  77763 0  DEC-12       DEC    -12
0027                         04,3463  37777 1  LOOPMAX      2OCT   3777737777     THESE TWO CONSTANTS MUST REMAIN
0027                         04,3464  37777 1
0028                         04,3465  37777 1  LOOPMAX1     2OCT   3777737777     ADJACENT AND THE SAME FOR INTEGRATION
0028                         04,3466  37777 1
0029  REF  5  LAST  715      04,3452                        ZERODP   =     ZEROVEC
0030  REF  3  LAST   31      04,3450                        HALFDP   =     XUNIT
```

```
 0001                              4767                          BLOCK  02
R0002  SINGLE PRECISION SINE AND COSINE

 00025  REF   1                                                   COUNT  02/INTER
 0003   REF  24  LAST 1171        4767  6 4675 1  SPCOS   AD     HALF          ARGUMENTS SCALED AT PI
 0004   REF   1                   4770  55'075 C  SPSIN   TS     TEMK
 0005   REF   1                   4771  1 4773 1          TCF    SPT
 0006   REF   2  LAST 1174        4772  4 1075 C          CS     TEMK
 0007                              4773  6 0000 1  SPT     DOUBLE
 0008   REF   3  LAST 1174        4774  55'075 C          TS     TEMK
 0009   REF   1                   4775  1 5006 C          TCF    POLLEY
 0010   REF   4  LAST 1174        4776  57'075 1          XCH    TEMK
 0011   REF   5  LAST 1174        4777  51'075 1          INDEX  TEMK
 0012   REF   4  LAST 110C        5000  6 4673 1          AD     LIMITS
 0013                              5001  4 0000 C          COM
 0014   REF   6  LAST 1174        5002  6 1075 1          AD     TEMK
 0015   REF   7  LAST 1174        5003  55'075 C          TS     TEMK
 0016   REF   2  LAST 1174        5004  1 5006 C          TCF    POLLEY
 0017   REF   1                   5005  1 5024 C          TCF    ARG90
 0018                              5006  0 0006 1  POLLEY  EXTEND
 0019   REF   8  LAST 1174        5007  7 1075 C          MP     TEMK
 0020   REF   1                   5010  55'076 C          TS     SQ
 0021                              5011  0 0006 1          EXTEND
 0022   REF   1                   5012  7 4742 C          MP     C5/2
 0023   REF   1                   5013  6 7706 1          AD     C3/2
 0024                              5014  0 0006 1          EXTEND
 0025   REF   2  LAST 1174        5015  7 1076 C          MP     SQ
 0026   REF   1                   5016  6 7666 C          AD     C1/2
 0027                              5017  0 0006 1          EXTEND
 0028   REF   9  LAST 1174        5020  7 1075 C          MP     TEMK
 0029                              5021  20 001 1          DDOUBL
 0030   REF  10  LAST 1174        5022  55'075 C          TS     TEMK
 0031   REF 276  LAST 1166        5023  0 0002 C          TC     Q
 0032   REF 32C  LAST 1166        5024  50 000 1  ARG90   INDEX  A
 0033   REF   5  LAST 1174        5025  4 4673 C          CS     LIMITS
 0034   REF 277  LAST 1174        5026  0 0002 C          TC     Q             RESULT SCALED AT 1
R0040                SPROOT WAS DELETED IN REV 51 OF MASTER. ASS. CONT. HAS CARDS.
```

```
 0001                                5027                    BLOCK   02
R0002           TC ENTER A JOB REQUEST REQUIRING NO VAC AREA:

 00025  REF   1                                               COUNT   02/EXEC

 00026                               5027  0 0004 0  NOVAC    INHINT
 0003   REF   1                     5030  6 5121 C          AD      FAKEPRET        LOC(MPAC +6) - LOC(QPRET)
 00031  REF   3  LAST  409          5031  54 063 C          TS      NEWPRIO         PRIORITY OF NEW JOB + NOVAC C(FIXLOC)

 0004                                5032  0 0006 1          EXTEND
 0005   REF 278  LAST 1174          5033  5 0002 C          INDEX   Q               Q WILL BE UNDISTURBED THROUGHOUT.
 0006                                5034  3 0001 0          DCA     Q               2CADR OF JOB ENTERED.
 0007   REF   1                     5035  52 066 C          DXCH    NEWLOC
 0008   REF   1                     5036  3 5120 1          CAF     EXECBANK
 0009   REF  24  LAST 1117          5037  56 004 C          XCH     FBANK
 0010   REF   1                     5040  54 061 1          TS      EXECTEM1
 0011   REF   1                     5041  1 2650 1          TCF     NOVAC2          ENTER EXECUTIVE BANK.

R0012           TC ENTER A JOB REQUEST REQUIRING A VAC AREA - E.G., ALL (PARTIALLY) INTERPRETIVE JOBS.

 0014                                5042  0 0004 C  FINDVAC  INHINT
 00145  REF   4  LAST 1175          5043  54 063 C          TS      NEWPRIO
 0015                                5044  0 0006 1          EXTEND
 0016   REF 275  LAST 1175          5045  5 0002 C          INDEX   Q
 0017                                5046  3 0001 C          DCA     Q
 0018   REF   2  LAST 1175          5047  52 066 C  SPVACIN  DXCH    NEWLOC
 0019   REF   2  LAST 1175          5050  3 5120 1          CAF     EXECBANK
 0020   REF  25  LAST 1175          5051  56 004 C          XCH     FBANK
 0021   REF   1                     5052  1 2626 C          TCF     FINDVAC2        OFF TO EXECUTIVE SWITCHED-BANK.

R0021           TC ENTER A FINDVAC WITH THE PRIORITY IN NEWPRIO TO THE 2CADR ARRIVING IN A AND L:

R0021?          USERS OF SPVAC MUST INHINT BEFORE STORING IN NEWPRIO.

 00213  REF 280  LAST 1175          5053  56 002 C  SPVAC    XCH     Q
 00214  REF   5  LAST 1017          5054  6 7715 C          AD      NEG2
 00215  REF 281  LAST 1175          5055  56 002 C          XCH     Q
 00216  REF   1                     5056  1 5047 C          TCF     SPVACIN

R0022           TC SUSPEND A BASIC JOB SO A HIGHER PRIORITY JOB MAY BE SERVICED:

 0024   REF 282  LAST 1175          5057  22 002 C  CHANG1   LXCH    Q
 0025   REF   3  LAST 1175          5060  3 5120 1          CAF     EXECBANK
 0026   REF  20  LAST 1097          5061  56 006 1          XCH     BBANK
 0027   REF   1                     5062  1 2727 C          TCF     CHANJOB

R0030           TC SUSPEND AN INTERPRETIVE JOB:

 0031   REF  28  LAST 1166          5063  4 0164 0  CHANG2   CS      LOC             NEGATIVE LOC SHOWS JOB = INTERPRETIVE.
R0031?          ITRACE (4) REFERS TO "CHANG2".
```

```
0032   REF 194  LAST 1154      5064  54 001 1          TS     L
0033   REF   4  LAST 1175      5065  3 5120 1   +2     CAF    EXECBANK
00335  REF  21  LAST 1175      5066  54 006 C           TS     BBANK
0034   REF   2  LAST 1175      5067  1 2726 1           TCF    CHANJOB -1
```

```
P0035           TO VOLUNTARILY SUSPEND A JOB UNTIL THE COMPLETION OF SOME ANTICIPATED EVENT (I/O EVENT ETC.):

 0037  REF  29  LAST 1175    5070  54 164 C  JOBSLEEP TS      LOC
 0038  REF   5  LAST 1176    5071  3 5120 1           CAF     EXECBANK
 0039  REF  26  LAST 1175    5072  54 004 1           TS      FBANK
 0040  REF   1               5073  1 3017 C           TCF     JOBSLP1

R0041           TO AWAKEN A JOB PUT TO SLEEP IN THE ABOVE FASHION:

 0042                        5074  0 0004 C  JOBWAKE  INHINT
 00421 REF   3  LAST 1175    5075  54 065 C           TS      NEWLOC
 0043  REF  59  LAST 1114    5076  4 4711 C           CS      TWO             EXIT IS VIA FINDVAC/NOVAC PROCEDURES.
 0044  REF 283  LAST 1175    5077  26 002 1           ADS     Q
 0045  REF   6  LAST 1177    5100  3 5120 1           CAF     EXECBANK
 0046  REF  27  LAST 1177    5101  56 004 C           XCH     FBANK
 0047  REF   1               5102  1 3044 C           TCF     JOBWAKE2

R0048           TO CHANGE THE PRIORITY OF A JOB CURRENTLY UNDER EXECUTION:

 0049                        5103  0 0004 C  PRIOCHNG INHINT          NEW PRIORITY ARRIVES IN A. RETURNS TO
 0050  REF   5  LAST 1175    5104  54 063 C           TS      NEWPRIO  CALLER AS SOON AS NEW JOB PRIORITY IS
 0051  REF   7  LAST 1177    5105  3 5120 1           CAF     EXECBANK HIGHEST. PREPARE FOR POSSIBLE BASIC-
 0052  REF  22  LAST 1176    5106  56 006 1           XCH     BBANK    STYLE CHANGE-JOB.
 0053  REF   9  LAST 1097    5107  54 165 1           TS      BANKSET
 0054  REF 264  LAST 1177    5110  3 0002 C           CA      Q
 0055  REF   1               5111  1 3113 C           TCF     PRIOCH2

R0058           TO REMOVE A JOB FROM EXECUTIVE CONSIDERATIONS:

 0059  REF   8  LAST 1177    5112  3 5120 1  ENDOFJOB CAF     EXECBANK
 0060  REF  28  LAST 1177    5113  54 004 1           TS      FBANK
 0061  REF   1               5114  1 3124 1           TCF     ENDJOB1

 0062  REF   2  LAST 1175    5115  3 0061 C  ENDFIND  CA      EXECTEM1        RETURN TO CALLER AFTER JOB ENTRY
 0063  REF  29  LAST 1177    5116  54 004 1           TS      FBANK           COMPLETE.
 0064  REF   1               5117  1 6710 C           TCF     Q+2
 0066  REF   2  LAST 1175    5120   02626 1  EXECBANK CADR    FINDVAC2

 00665 REF 636  LAST 1162    5121   00110 1  FAKEPRET ADRES   MPAC -36D       LOC(MPAC +6) - LOC(QPRET)
```

P0067 LOCATE AN AVAILABLE VAC AREA.

```
0068                        01,2626                     BANK    01
00685  REF   1                                          COUNT   01/EXEC

0069   REF   3  LAST 1177   01,2626  54 061 1  FINDVAC2 TS      EXECTEM1     (SAVE CALLER'S BANK FIRST.)
0070   REF   4  LAST  216   01,2627  10 400 1           CCS     VAC1USE
0071   REF   1              01,2630  1 2643 0           TCF     VACFOUND
0072   REF   3  LAST  216   01,2631  10 454 0           CCS     VAC2USE
0073   REF   2  LAST 1178   01,2632  1 2643 0           TCF     VACFOUND
0074   REF   3  LAST  216   01,2633  10 530 0           CCS     VAC3USE
0075   REF   3  LAST 1178   01,2634  1 2643 0           TCF     VACFOUND
0076   REF   3  LAST  216   01,2635  10 604 1           CCS     VAC4USE
0077   REF   4  LAST 1178   01,2636  1 2643 0           TCF     VACFOUND
0078   REF   3  LAST  216   01,2637  10 660 0           CCS     VAC5USE
0079   REF   5  LAST 1178   01,2640  1 2643 0           TCF     VACFOUND
0080   REF   4  LAST  559   01,2641  0 5604 0           TC      BAILOUT
0081                        01,2642   01201 0           OCT     1201         NO VAC AREAS.

0082   REF  60  LAST 1177   01,2643  6 4711 1  VACFOUND AD      TWO          RESERVE THIS VAC AREA BY STORING A ZERO
0083                        01,2644  22 007 0           ZL                   IN ITS VAC USE REGISTER AND STORE THE
0084   REF 321  LAST 1174   01,2645  50 000 1           INDEX   A            ADDRESS OF THE FIRST WORD OF IT IN THE
0085                        01,2646  21'777 0           LXCH    0 -1         LOW NINE BITS OF THE PRIORITY WORD.
0086   REF   6  LAST 1177   01,2647  26 063 0           ADS     NEWPRIO

0087   REF 236  LAST 1156   01,2650  3 4714 1  NOVAC2   CAF     ZERO         NOVAC ENTERS HERE. FIND A CORE SET.
0088   REF   5  LAST  413   01,2651  54 064 1           TS      LOCCTR
0089   REF   1              01,2652  3 2657 1           CAF     NO.CORES     SEVEN SETS OF ELEVEN REGISTERS EACH.
0090   REF   1              01,2653  54 062 1  NOVAC3   TS      EXECTEM2
0091   REF   6  LAST 1178   01,2654  50 064 0           INDEX   LOCCTR
0092   REF   8  LAST  186   01,2655  10 167 0           CCS     PRIORITY     EACH PRIORITY REGISTER CONTAINS -0 IF
0093   REF   1              01,2656  1 2717 0           TCF     NEXTCORE     THE CORRESPONDING CORE SET IS AVAILABLE.
0094                        01,2657   00006 1  NO.CORES DEC     6
0095   REF   2  LAST 1178   01,2660  1 2717 0           TCF     NEXTCORE     AN ACTIVE JOB HAS A POSITIVE PRIORITY
A0096                                                                       BUT A DORMANT JOB'S PRIORITY IS NEGATIVE
```

```
0097  REF   7  LAST 1178   01,2661  3 0063 1  CORFOUND CA     NEWPRIO    SET THE PRIORITY OF THIS JOB IN THE CORE
0098  REF   7  LAST 1178   01,2662  50 064 C             INDEX  LOCCTR     SET'S PRIORITY REGISTER AND SET THE
0099  REF   9  LAST 1178   01,2663  54 167 0             TS     PRIORITY   JOB'S PUSH-DOWN POINTER AT THE BEGINNING
0100  REF   4  LAST  225   01,2664  7 4741 C             MASK   LOW9       OF THE WORK AREA AND OVERFLOW INDICATOR
0101  REF   8  LAST 1179   01,2665  50 064 C             INDEX  LOCCTR
0102  REF  19  LAST 1149   01,2666  54 166 1             TS     PUSHLOC    OFF TO PREPARE FOR INTERPRETIVE PROGRAMS

0103  REF   9  LAST 1179   01,2667  10 064 1             CCS    LOCCTR     IF CORE SET ZERO IS BEING LOADED, SET UP
0104  REF   1               01,2670  1 2704 1             TCF    SETLOC     OVFIND AND FIXLOC IMMEDIATELY .
0105  REF  11  LAST 1162   01,2671  54 121 1             TS     OVFIND
0106  REF  20  LAST 1179   01,2672  3 0166 C             CA     PUSHLOC
0107  REF  34  LAST 1163   01,2673  54 120 C             TS     FIXLOC

0108  REF   6  LAST 1075   01,2674  10 067 1  SPECTEST CCS    NEWJOB     SEE IF ANY ACTIVE JOBS WAITING (RARE).
0109  REF   2  LAST 1179   01,2675  1 2704 1             TCF    SETLOC     MUST BE AWAKENED BUT UNCHANGED JOB.
0110  REF  10  LAST 1166   01,2676  0 5642 1             TC     CCSHOLE
0111  REF  11  LAST 1179   01,2677  0 5642 1             TC     CCSHOLE
0112  REF   7  LAST 1179   01,2700  54 067 1             TS     NEWJOB     +0 SHOWS ACTIVE JOB ALREADY SET.
0113  REF   4  LAST 1177   01,2701  52 066 C             DXCH   NEWLOC
0114  REF  30  LAST 1177   01,2702  52 165 1             DXCH   LOC
0115  REF   1               01,2703  1 5115 C             TCF    ENDFIND

0116  REF   5  LAST 1179   01,2704  52 066 C  SETLOC     DXCH   NEWLOC     SET UP THE LOCATION REGISTERS FOR THIS
0117  REF  10  LAST 1179   01,2705  50 064 C             INDEX  LOCCTR
0118  REF  31  LAST 1179   01,2706  52 165 1             DXCH   LOC
0119  REF   8  LAST 1179   01,2707  50 067 C             INDEX  NEWJOB     THIS INDEX INSTRUCTION INSURES THAT THE
0120  REF  10  LAST 1179   01,2710  4 0167 0             CS     PRIORITY   HIGHEST ACTIVE PRIORITY WILL BE COMPARED
0121  REF   8  LAST 1179   01,2711  6 0063 1             AD     NEWPRIO    WITH THE NEW PRIORITY TO SEE IF NEWJOB
0122                        01,2712  0 0006 1             EXTEND            SHOULD BE SET TO SIGNAL A SWITCH.
0123  REF   2  LAST 1179   01,2713  6 5115 1             BZMF   ENDFIND
0124  REF  11  LAST 1179   01,2714  3 0064 C             CA     LOCCTR     LOCCTR IS LEFT SET AT THIS CORE SET IF
0125  REF   9  LAST 1179   01,2715  54 067 1             TS     NEWJOB     THE CALLER WANTS TO LOAD ANY MPAC
0126  REF   3  LAST 1179   01,2716  1 5115 C             TCF    ENDFIND    REGISTERS, ETC.

0127  REF   1               01,2717  3 3054 C  NEXTCORE CAF    CORE INC
0128  REF  12  LAST 1179   01,2720  26 064 1             ADS    LOCCTR
0129  REF   2  LAST 1178   01,2721  10 062 1             CCS    EXECTEM2
0130  REF   1               01,2722  1 2653 1             TCF    NOVAC3
0131  REF   5  LAST 1178   01,2723  0 5604 C             TC     BAILOUT    NO CORE SETS.
0132                        01,2724   01202 0             OCT    1202
```

P0133 THE FOLLOWING ROUTINE SWAPS CORE SET 0 WITH THAT WHOSE RELATIVE ADDRESS IS IN NEWJOB.

```
01345  REF  32  LAST 1179  01,2725  22 164 1  -2       LXCH   LOC
0135   REF  10  LAST 1177  01,2726  30 165 0  -1       CAE    BANKSET      BANKSET, NOT BBANK, HAS RIGHT CONTENTS.
0136                       01,2727  0 0004 0   CHANJOB  INHINT
01362                      01,2730  0 0006 1            EXTEND
01364  REF  14  LAST 1073  01,2731  04 007 1           ROR    SUPERBNK     PICK UP CURRENT SBANK FOR BBCON
01366  REF 195  LAST 1176  01,2732  56 001 0           XCH    L            LOC IN A AND BBCON IN L.
01368  REF  10  LAST 1179  01,2733  50 067 0  +4       INDEX  NEWJOB       SWAP LOC AND BANKSET.
0137   REF  33  LAST 1180  01,2734  52 165 1           DXCH   LOC
0138   REF  34  LAST 1180  01,2735  52 165 1           DXCH   LOC

01382  REF  11  LAST 1180  01,2736  30 165 0           CAE    BANKSET
01384                      01,2737  0 0006 1            EXTEND
01388  REF  15  LAST 1180  01,2740  01 007 1           WRITE  SUPERBNK     SET SBANK FOR NEW JOB.
0139   REF 637  LAST 1177  01,2741  52 155 1           DXCH   MPAC         SWAP MULTI-PURPOSE ACCUMULATOR AREAS.
0140   REF  11  LAST 1180  01,2742  50 067 0           INDEX  NEWJOB
0141   REF 638  LAST 1180  01,2743  52 155 1           DXCH   MPAC
0142   REF 639  LAST 1180  01,2744  52 155 1           DXCH   MPAC
0143   REF 640  LAST 1180  01,2745  52 157 0           DXCH   MPAC +2
0144   REF  12  LAST 1180  01,2746  50 067 0           INDEX  NEWJOB
0145   REF 641  LAST 1180  01,2747  52 157 0           DXCH   MPAC +2
0146   REF 642  LAST 1180  01,2750  52 157 0           DXCH   MPAC +2
0147   REF 643  LAST 1180  01,2751  52 161 0           DXCH   MPAC +4
0148   REF  13  LAST 1180  01,2752  50 067 0           INDEX  NEWJOB
0149   REF 644  LAST 1180  01,2753  52 161 0           DXCH   MPAC +4
0150   REF 645  LAST 1180  01,2754  52 161 0           DXCH   MPAC +4
0151   REF 646  LAST 1180  01,2755  52 163 1           DXCH   MPAC +6
0152   REF  14  LAST 1180  01,2756  50 067 0           INDEX  NEWJOB
0153   REF 647  LAST 1180  01,2757  52 163 1           DXCH   MPAC +6
0154   REF 648  LAST 1180  01,2760  52 163 1           DXCH   MPAC +6

0155   REF 237  LAST 1178  01,2761  3 4714 1           CAF    ZERO
0156   REF  12  LAST 1179  01,2762  56 121 0           XCH    OVFIND       MAKE PUSHLOC NEGATIVE IF OVFIND NZ.
0157                       01,2763  0 0006 1            EXTEND
0158                       01,2764  1 2767 1            BZF    +3
0159   REF  21  LAST 1179  01,2765  4 0166 1           CS     PUSHLOC
0160   REF  22  LAST 1180  01,2766  54 166 1           TS     PUSHLOC

0161   REF  23  LAST 1180  01,2767  52 167 0           DXCH   PUSHLOC
0162   REF  15  LAST 1180  01,2770  50 067 0           INDEX  NEWJOB
0163   REF  24  LAST 1180  01,2771  52 167 0           DXCH   PUSHLOC
0164   REF  25  LAST 1180  01,2772  52 167 0           DXCH   PUSHLOC      SWAPS PUSHLOC AND PRIORITY.
0165   REF   5  LAST 1179  01,2773  3 4741 1           CAF    LOW9         SET FIXLOC TO BASE OF VAC AREA.
0166   REF  11  LAST 1179  01,2774  7 0167 0           MASK   PRIORITY
0167   REF  35  LAST 1179  01,2775  54 120 0           TS     FIXLOC

0168   REF  26  LAST 1180  01,2776  10 166 1           CCS    PUSHLOC      SET OVERFLOW INDICATOR ACCORDING TO
0169   REF 238  LAST 1180  01,2777  3 4714 1           CAF    ZERO
0170   REF   1             01,3000  1 3005 0           TCF    ENDPRCHG -1
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0171   REF  27  LAST 118C   01,3001  4 0166 1          CS      PUSHLOC
0172   REF  28  LAST 1181   01,3002  54 166 1          TS      PUSHLOC
0173   REF 141  LAST 1144   01,3003  3 4712 1          CAF     ONE
0174   REF  13  LAST 118C   01,3004  56 121 C          XCH     OVFIND
0175   REF  16  LAST 118C   01,3005  54 067 1          TS      NEWJCB

0176                        01,3006  0 0003 1  ENDPRCHG RELINT
0177   REF  35  LAST 118C   01,3007  52 165 1          DXCH    LOC             BASIC JOBS HAVE POSITIVE ADDRESSES, SO
0178                        01,3010  0 0006 1          EXTEND                  DISPATCH WITH A DTCB.
0179                        01,3011  6 3013 C          BZMF    +2              IF INTERPRETIVE, SET UP EBANK, ETC.
0180                        01,3012  52 006 0          DTCB
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0181                          01,3013  4 0000 C          COM                    EPILOGUE TO JOB CHANGE FOR INTERPRETIVE
0182  REF 142  LAST 1181     01,3014  6 4712 1          AD      ONE
0183  REF  36  LAST 1181     01,3015  54 164 C          TS      LOC            RESUME.
0186  REF   1                 01,3016  1 6017 C          TCF     INTRSM

R0187           COMPLETE JOBSLEEP PREPARATIONS.

0188                          01,3017  0 0004 C  JOBSLP1  INHINT
0189  REF  12  LAST 118C     01,3020  4 0167 C          CS      PRIORITY       NNZ PRIORITY SHOWS JOB ASLEEP.
0190  REF  13  LAST 1182     01,3021  54 167 C          TS      PRIORITY
0191  REF   8  LAST 1116     01,3022  3 6043 C          CAF     LOW7
0192  REF  23  LAST 1177     01,3023  7 0006 C          MASK    BBANK
01921                         01,3024  0 0006 1          EXTEND
01922 REF  16  LAST 118C     01,3025  04 007 1          ROR     SUPERBNK       SAVE OLD SUPERBANK VALUE.
0193  REF  12  LAST 118C     01,3026  54 165 1          TS      BANKSET
0194  REF 239  LAST 118C     01,3027  4 4714 C          CS      ZERO
0195  REF 111  LAST 1152     01,3030  54 131 C  JOBSLP2  TS      BUF +1         HOLDS - HIGHEST PRIORITY.
0196  REF   1                 01,3031  1 3141 1          TCF     EJSCAN         SCAN FOR HIGHEST PRIORITY ALA ENDOFJOB.

01961                         01,3032  0 0004 C  NUCHANG2 INHINT                 QUICK... DONT LET NEWJOB CHANGE TO +0 .
019611 REF  17  LAST 1181     01,3033  10 067 1          CCS     NEWJOB
019612                        01,3034  1 3037 1          TCF     +3             NEWJOB STILL NNZ
019613                        01,3035  0 0003 1          RELINT                 NEWJOB HAS CHANGED TO +0. WAKE UP JOB
019614 REF   1                 01,3036  1 3233 1          TCF     ADVAN +2       VIA NUDIRECT. (VERY RARE CASE.)

01962 REF  61  LAST 1178     01,3037  3 4711 1          CAF     TWO
01963                         01,3040  0 0006 1          EXTEND
01964 REF  3C  LAST  903     01,3041  05 011 1          WOR     DSALMOUT       TURN ON ACTIVITY LIGHT
01965 REF  37  LAST 1182     01,3042  52 165 1          DXCH    LOC            AND SAVE ADDRESS INFO FOR BENEFIT OF
01966 REF   3  LAST 1176     01,3043  1 2733 C          TCF     CHANJOB + 4     POSSIBLE SLEEPING JOB.
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PG197           IC WAKE UP A JOB, EACH CORE SET IS FOUND TO LOCATE ALL JOBS WHICH ARE ASLEEP. IF THE FCADR IN THE
RG199   LOC REGISTER OF ANY SUCH JOB MATCHES THAT SUPPLIED BY THE CALLER, THAT JOB IS AWAKENED. IF NO JOB IS FOUND,
RG201   LOCCTR IS SET TO -1 AND NC FURTHER ACTION TAKES PLACE.

 0202   REF   4  LAST 1178   01,3044  54 061 1  JOBWAKE2 TS    EXECTEM1
 0203   REF 240  LAST 1182   01,3045  3 4714 1            CAF   ZERO        BEGIN CORE SET SCAN.
 0204   REF  13  LAST 1179   01,3046  54 064 1            TS    LOCCTR
 0205   REF   2  LAST 1178   01,3047  3 2657 1            CAF   NO.CORES
 0206   REF   3  LAST 1179   01,3050  54 062 1  JOBWAKE4 TS    EXECTEM2
 0207   REF  14  LAST 1183   01,3051  50 064 C            INDEX LOCCTR
 0208   REF  14  LAST 1182   01,3052  10 167 C            CCS   PRIORITY
 0209   REF   1              01,3053  1 3056 C            TCF   JOBWAKE3    ACTIVE JOB - CHECK NEXT CORE SET.
 0210                        01,3054   00014 1  COREINC  DEC   12          12 REGISTERS PER CORE SET.
 0211   REF   1              01,3055  1 3065 C            TCF   WAKETEST    SLEEPING JOB - SEE IF CADR MATCHES.

 0212   REF   2  LAST 1179   01,3056  3 3054 C  JOBWAKE3 CAF   COREINC
 0213   REF  15  LAST 1183   01,3057  26 064 1            ADS   LOCCTR
 0214   REF   4  LAST 1183   01,3060  10 062 1            CCS   EXECTEM2
 0215   REF   1              01,3061  1 3050 C            TCF   JOBWAKE4
 0216   REF 143  LAST 1182   01,3062  4 4712 C            CS    ONE         EXIT IF SLEEPING JOB NOT FOUND.
 0217   REF  16  LAST 1183   01,3063  54 064 1            TS    LOCCTR
 0218   REF   4  LAST 1179   01,3064  1 5115 C            TCF   ENDFIND

 0219   REF   6  LAST 1179   01,3065  4 0065 C  WAKETEST CS    NEWLOC
 0220   REF  17  LAST 1183   01,3066  50 064 C            INDEX LOCCTR
 0221   REF  38  LAST 1182   01,3067  6 0164 1            AD    LOC
 0222                        01,3070  0 0006 1            EXTEND
 0223                        01,3071  1 3073 1            BZF   +2          IF MATCH.
 0224   REF   2  LAST 1183   01,3072  1 3056 C            TCF   JOBWAKE3    EXAMINE NEXT CORE SET IF NO MATCH.

 0225   REF  18  LAST 1183   01,3073  50 064 C            INDEX LOCCTR      RE-COMPLEMENT PRIORITY TO SHOW JOB AWAKE
 0226   REF  15  LAST 1183   01,3074  4 0167 C            CS    PRIORITY
 0227   REF   9  LAST 1179   01,3075  54 063 C            TS    NEWPRIO
 0228   REF  19  LAST 1183   01,3076  50 064 C            INDEX LOCCTR
 0229   REF  16  LAST 1183   01,3077  54 167 C            TS    PRIORITY

 0230   REF   1              01,3100  4 4364 C            CS    FBANKMSK    MAKE UP THE 2CADR OF THE WAKE ADDRESS
 0231   REF   7  LAST 1183   01,3101  7 0065 C            MASK  NEWLOC      USING THE CADR IN NEWLOC AND THE EBANK
 0232   REF   3  LAST 1095   01,3102  6 4700 1            AD    2K          HALF OF BBANK SAVED IN BANKSET.
 0233   REF   8  LAST 1183   01,3103  56 065 1            XCH   NEWLOC
 0234   REF   2  LAST 1183   01,3104  7 4364 C            MASK  FBANKMSK
 0235   REF  20  LAST 1183   01,3105  50 064 C            INDEX LOCCTR
 0236   REF  13  LAST 1182   01,3106  6 0165 C            AD    BANKSET
 0237   REF   9  LAST 1183   01,3107  54 066 C            TS    NEWLOC +1

 0238   REF  21  LAST 1183   01,3110  10 064 1            CCS   LOCCTR      SPECIAL TREATMENT IF THIS JOB WAS
 0239   REF   3  LAST 1179   01,3111  1 2704 1            TCF   SETLOC      ALREADY IN THE RUN (0) POSITION.
 0240   REF   1              01,3112  1 2674 1            TCF   SPECTEST
```

P0241 PRIORITY CHANGE. CHANGE THE CONTENTS OF PRIORITY AND SCAN FOR THE JOB OF HIGHEST PRIORITY.

```
0243   REF  39  LAST 1183   01,3113  54 164 C  PRIOCH2  TS     LOC
0244   REF 241  LAST 1183   01,3114  3 4714 1           CAF    ZERO      SET FLAG TO TELL ENDJOB SCANNER IF THIS
0245   REF 112  LAST 1182   01,3115  54 130 1           TS     BUF       JOB IS STILL HIGHEST PRIORITY.
0246   REF   6  LAST 118C   01,3116  3 4741 1           CAF    LOW9
0247   REF  17  LAST 1183   01,3117  7 0167 C           MASK   PRIORITY
0248   REF  10  LAST 1183   01,3120  6 0063 1           AD     NEWPRIO
0249   REF  18  LAST 1184   01,3121  54 167 C           TS     PRIORITY
0250                        01,3122  4 0000 C           COM
0251   REF   1              01,3123  1 3030 C           TCF    JOBSLP2   AND TO EJSCAN.
```

P0252 RELEASE THIS CORE SET AND VAC AREA AND SCAN FOR THE JOB OF HIGHEST ACTIVE PRIORITY.

```
0254                              01,3124  0 0004 C  ENDJOB1  INHINT
0255   REF 242  LAST 1184        01,3125  4 4714 C            CS      ZERO
0256   REF 113  LAST 1184        01,3126  54 131 C            TS      BUF +1
0257   REF  19  LAST 1184        01,3127  56 167 1            XCH     PRIORITY
0258   REF   7  LAST 1184        01,3130  7 4741 C            MASK    LOW9
02581  REF 196  LAST 1180        01,3131  54 001 1            TS      L

02582  REF   2  LAST 1179        01,3132  4 5121 1            CS      FAKEPRET
025821 REF 197  LAST 1185        01,3133  6 0001 0            AD      L

02583                             01,3134  0 0006 1            EXTEND
02584  REF   2  LAST 1182        01,3135  6 3141 C            BZMF    EJSCAN          NOVAC ENDOFJOB

0259   REF 198  LAST 1185        01,3136  10 001 1            CCS     L
0260   REF 322  LAST 1178        01,3137  50 000 1            INDEX   A
0261                              01,3140  54 000 C            TS      0

0262   REF  20  LAST 1185        01,3141  10 203 1  EJSCAN    CCS     PRIORITY +12D
0263   REF   1                   01,3142  0 3206 C            TC      EJ1
0264   REF  12  LAST 1179        01,3143  0 5642 1            TC      CCSHOLE
0265                              01,3144  1 3145 C            TCF     +1

0266   REF  21  LAST 1185        01,3145  10 217 1            CCS     PRIORITY +24D   EXAMINE EACH PRIORITY REGISTER TO FIND
0267   REF   2  LAST 1185        01,3146  0 3206 C            TC      EJ1             THE JOB OF HIGHEST ACTIVE PRIORITY.
0268   REF  13  LAST 1185        01,3147  0 5642 1            TC      CCSHOLE
0269                              01,3150  1 3151 C            TCF     +1

0270   REF  22  LAST 1185        01,3151  10 233 1            CCS     PRIORITY +36D
0271   REF   3  LAST 1185        01,3152  0 3206 C            TC      EJ1
0272   REF  23  LAST 1185        01,3153   67610 1  -CCSPR    -CCS    PRIORITY
0273                              01,3154  1 3155 1            TCF     +1

0274   REF  24  LAST 1185        01,3155  10 247 1            CCS     PRIORITY +48D
0275   REF   4  LAST 1185        01,3156  0 3206 C            TC      EJ1
0276   REF  14  LAST 1185        01,3157  0 5642 1            TC      CCSHOLE
0277                              01,3160  1 3161 C            TCF     +1

0278   REF  25  LAST 1185        01,3161  10 263 1            CCS     PRIORITY +60D
0279   REF   5  LAST 1185        01,3162  0 3206 0            TC      EJ1
0280   REF  15  LAST 1185        01,3163  0 5642 1            TC      CCSHOLE
0281                              01,3164  1 3165 1            TCF     +1

0282   REF  26  LAST 1185        01,3165  10 277 1            CCS     PRIORITY +72D
0283   REF   6  LAST 1185        01,3166  0 3206 C            TC      EJ1
0284   REF  16  LAST 1185        01,3167  0 5642 1            TC      CCSHOLE
0285                              01,3170  1 3171 1            TCF     +1
```

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P0286           EVALUATE THE RESULTS OF THE SCAN.

 0287  REF 114  LAST 1185   01,3171  10 131 C        CCS   BUF +1        SEE IF THERE ARE ANY ACTIVE JOBS WAITING
 0288  REF  17  LAST 1185   01,3172  0 5642 1        TC    CCSHOLE
 0289  REF  18  LAST 1186   01,3173  0 5642 1        TC    CCSHOLE

 0290                       01,3174  1 3176 C        TCF   +2
 0291  REF   2  LAST  18C   01,3175  1 3223 C        TCF   DUMMYJOB
 0292  REF 115  LAST 1186   01,3176  10 130 1        CCS   BUF             BUF IS ZERO IF THIS IS A PRIOCHNG AND
 0293                       01,3177  1 3201 C        TCF   +2              CHANGED PRIORITY IS STILL HIGHEST.
 0294  REF   2  LAST 118C   01,3200  1 3005 C        TCF   ENDPRCHG -1

 0295  REF 323  LAST 1185   01,3201  50 000 1        INDEX A               OTHERWISE, SET NEWJOB TO THE RELATIVE
 0296                       01,3202  2'7777 C        CAF   0 -1            ADDRESS OF THE NEW JOB'S CORE SET.
 0297  REF   1              01,3203  6 3153 C        AD    -CCSPR
 0298  REF  18  LAST 1182   01,3204  54 067 1        TS    NEWJOB
 0299  REF   4  LAST 1182   01,3205  1 2725 1        TCF   CHANJOB -2

 0300  REF 116  LAST 1186   01,3206  54 132 C  EJ1   TS    BUF +2
 0301  REF 117  LAST 1186   01,3207  6 0131 1        AD    BUF +1          - OLD HIGH PRIORITY.
 0302  REF 324  LAST 1186   01,3210  10 000 C        CCS   A
 0303  REF 118  LAST 1186   01,3211  4 0132 C        CS    BUF +2
 0304  REF   1              01,3212  1 3216 C        TCF   EJ2             NEW HIGH PRIORITY.
 0305                       01,3213  13 214 1        NOOP
 0306  REF 285  LAST 1177   01,3214  50 002 C        INDEX Q
 0307                       01,3215  0 0002 C        TC    2               PROCEED WITH SEARCH.

 0308  REF 119  LAST 1186   01,3216  54 131 C  EJ2   TS    BUF +1
 0309                       01,3217  0 0006 1        EXTEND
 0310  REF 120  LAST 1186   01,3220  22 130 C        QXCH  BUF             FOR LOCATING CCS PRIORITY + X INSTR.
 0311  REF 121  LAST 1186   01,3221  50 130 C        INDEX BUF
 0312                       01,3222  0 0002 C        TC    2
```

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P0314           IDLING AND COMPUTER ACTIVITY (GREEN) LIGHT MAINTENANCE. THE IDLING ROUTINE IS NOT A JOB IN ITSELF,
R0316   BUT RATHER A SUBROUTINE OF THE EXECUTIVE.

 0318   REF   4  LAST  256      1361                          EBANK= SELFRET          SELF-CHECK STORAGE IN EBANK.

 0319   REF 243  LAST 1185   01,3223  4 4714 C  DUMMYJOB CS     ZERO                 SET NEWJOB TO -0 FOR IDLING.
 0320   REF  19  LAST 1186   01,3224  54 067 1           TS     NEWJCB
 0321                        01,3225  0 0003 1           RELINT
 0322   REF  62  LAST 1182   01,3226  4 4711 C           CS     TWO                  TURN OFF THE ACTIVITY LIGHT.
 0323                        01,3227  0 0006 1           EXTEND
 0324   REF  31  LAST 1182   01,3230  03 011 1           WAND   DSALMOUT
 0328   REF  2C  LAST 1187   01,3231  10 067 1  ADVAN     CCS    NEWJOB               IS A NEWJOB ACTIVE ?
 0329   REF   1              01,3232  1 3032 1           TCF    NUCHANG2             YES... ONE REQUIRING A CHANGE JOB.
 0330   REF  63  LAST 1187   01,3233  3 4711 1           CAF    TWO                  NEW JOB ALREADY IN POSITION FOR
 0331   REF   1              01,3234  1 3242 1           TCF    NUDIRECT             EXECUTION.

 03317  REF   5  LAST 1187   01,3235  3 1361 1           CA     SELFRET
 03318  REF 159  LAST 1185   01,3236  54 001 1           TS     L                    PUT RETURN ADDRESS IN L.
 0332   REF   1              01,3237  3 3241 C           CAF    SELFBANK
 0333   REF   4  LAST  62C   01,3240  1 5123 C           TCF    SUPDXCHZ + 1          AND DISPATCH JCB.

 03338  REF   6  LAST 1187      1361                          EBANK= SELFRET
 0334   REF   3  LAST  256   01,3241    66102 1  SELFBANK BBCON  SELFCHK

 0335                        01,3242  0 0006 1  NUDIRECT EXTEND                     TURN THE GREEN LIGHT BACK ON.
 0336   REF  32  LAST 1187   01,3243  05 011 1           WOR    DSALMOUT
 0337   REF  40  LAST 1184   01,3244  52 165 1           DXCH   LOC                  JOBS STARTED IN THIS FASHION MUST BE
 03372  REF   5  LAST 1187   01,3245  1 5122 1           TCF    SUPDXCHZ

 03378                           5122                    BLOCK  2                    IN FIXED-FIXED SO OTHERS MAY USE.

 03379  REF   2 LAST 1175 TC 1178:    59     59*         COUNT  02/EXEC

R03379 1 SUPDXCHZ - ROUTINE TO TRANSFER TO SUPERBANK.
R03379 2 CALLING SEQUENCE
A03379 3                                                TCF    SUPDXCHZ             WITH 2CADR OF DESIRED LOCATION IN A + L.

 0338   REF 200  LAST 1187      5122  56 001 C  SUPDXCHZ XCH    L                    BASIC.
 03381                          5123  0 0006 1  +1       EXTEND
 03382  REF  17  LAST 1182      5124  01 007 1           WRITE  SUPERBNK
 03383  REF  24  LAST 1182      5125  54 006 C           TS     BBANK
 03384  REF 201  LAST 1187      5126  0 0001 C           TC     L

 0339                           5127   77677 1  NEG100   OCT    77677
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L WAITLIST USER'S PAGE NO. 1 EO S3

R0001 PROGRAM DESCRIPTION DATE - 10 OCTOBER 1966
R0003 MOD NO - 2 LOG SECTION - WAITLIST
R0005 MOD BY - MILLER (DTMAX INCREASED TO 162.5 SEC) ASSEMBLY SUNBURST REV 5
R0072 MOD 3 BY KERNAN (INHINT INSERTED AT WAITLIST) 2/28/68 SKIPPER REV 4

R0073 MOD 4BY KERNAN (TWIDDLE IN 54) 3/28/68 SKIPPER REV 13.
R0079

R0008 FUNCTIONAL DESCRIPTION-
R0009 PART OF A SECTION OF PROGRAMS,-WAITLIST, TASKOVER, T3RUPT, USED TO CALL A PROGRAM, (CALLED A TASK),
R0011 WHICH IS TO BEGIN IN C(A) CENTISECONDS. WAITLIST UPDATES TIME3, LST1 AND LST2. THE MEANING OF THESE LISTS
R0013 FOLLOW.

R0014 C(TIME3) = 16384 -(T1-T) CENTISECONDS, (T=PRESENT TIME, T1-TIME FOR TASK1)
R0016

R0017 C(LST1) = -(T2-T1)+1
R0018 C(LST1 +1) = -(T3-T2)+1
R0019 C(LST1 +2) = -(T4-T3)+1
R0020 .
R0021 .
R0022 C(LST1 +6) = -(T8-T7)+1
R0023 C(LST1 +7) = -(T9-T8)+1

R0024 C(LST2) = 2CADR OF TASK1
R0025 C(LST2 +2) = 2CADR OF TASK2
R0026 .
R0027 .
R0028 C(LST2 +14)= 2CADR OF TASK8
R0029 C(LST2 +16)= 2CADR OF TASK9

R0030 WARNINGS-
R0031 --------
R0032 1) 1 <= C(A) <= 162500 (1 CENTISECOND TO 162.5 SEC)
R0033 2) 9 TASKS MAXIMUM
R0034 3) TASKS CALLED UNDER INTERRUPT INHIBITED
R0035 4) TASKS END BY TC TASKOVER

R0036 CALLING SEQUENCE-

R0037 L-1 CA DELTAT (TIME IN CENTISECONDS TO TASK START)
R0039 L TC WAITLIST
R0040 L+1 2CADR DESIRED TASK
R0041 L+2 (MINOR OF 2CADR)
R0042 L+3 RELINT (RETURNS HERE)

R0042 TWIDDLE-
R0042 -------
R0042 TWIDDLE IS FOR USE WHEN THE TASK BEING SET UP IS IN THE SAME EBANK AND FBANK AS THE USER. IN
R0042 SUCH CASES, IT IMPROVES UPON WAITLIST BY ELIMINATING THE NEED FOR THE BBCON HALF OF THE 2CADR,

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R0042?              SAVING A WORD.  TWIDDLE IS LIKE WAITLIST IN EVERY RESPECT EXCEPT CALLING SEQUENCE, TO WIT-

R0043               L-1     CA      DELTAT
R0043?              L       TC      TWIDDLE
R0043?              L+1     ADRES   DESIRED TASK
R0043?              L+2     RELINT                  (RETURNS HERE)

R0043S  NORMAL EXIT MODES-

R0044               AT L+3 OF CALLING SEQUENCE

R0045   ALARM OR ABORT EXIT MODES-

R0046               TC      ABORT
R0047               OCT     1203    (WAITLIST OVERFLOW - TOO MANY TASKS)

R0048   ERASABLE INITIALIZATION REQUIRED-

R0049               ACCOMPLISHED BY FRESH START,--LST2,..., LST2 +16 =ENDTASK
R0050                                        LST1,..., LST1 +7  =NEG1/2

R0051   OUTPUT--

R0052               LST1 AND LST2 UPDATED WITH NEW TASK AND ASSOCIATED TIME.

R0053   DEBRIS-

R0054                   CENTRALS- A,Q,L
R0055                   OTHER   - WAITEXIT, WAITADR, WAITTEMP, WAITBANK
R0056   DETAILED ANALYSIS OF TIMING-

R0057           CONTROL WILL NOT BE RETURNED TO THE SPECIFIED ADDRESS (2CADR)  IN EXACTLY DELTA T CENTISECONDS.
R0059       THE APPROXIMATE TIME MAY BE CALCULATED AS FOLLOWS

R0060               LET T0 = THE TIME OF THE TC WAITLIST
R0061               LET TS = T0 +147U + COUNTER INCREMENTS (SET UP TIME)
R0062               LET X  = TS -(100TS)/100  (VARIANCE FROM COUNTERS)
R0063               LET Y  = LENGTH OF TIME OF INHIBIT INTERRUPT AFTER T3RUPT
R0064               LET Z  = LENGTH OF TIME TO PROCESS TASKS WHICH ARE DUE THIS T3RUPT BUT DISPATCHED EARLIER.
R0066       (Z=0, USUALLY)
R0067               LET DELTD = THE ACTUAL TIME TAKEN TO GIVE CONTROL TO 2CADR
R0068             THEN   DELTD = TS+DELTA T -X +Y +Z +1.05MS* +COUNTERS*
R0069       *-THE TIME TAKEN BY WAITLIST ITSELF AND THE COUNTER TICKING DURING THIS WAITLIST TIME.
R0071

R0072           IN SHORT, THE ACTUAL TIME TO RETURN CONTROL TO A 2CADR IS AUGMENTED BY THE TIME TO SET UP THE TASK'S
R0074       INTERRUPT, ALL COUNTERS TICKING, THE T3RUPT PROCESSING TIME, THE WAITLIST PROCESSING TIME AND THE POSSIBILITY
R0076       OF OTHER TASKS INHIBITING THE INTERRUPT.


 0077                          5130                          BLOCK  02
```

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0078   REF  14  LAST  188   E3,1400                          EBANK= LST1          TASK  LISTS IN SWITCHED E BANK.

0079   REF   1                                               COUNT  02/WAIT

00795                                 5130  0 0004 C  TWIDDLE  INHINT
0080   REF 202  LAST 1187            5131  54 001 1            TS     L           SAVE DELAY TIME IN L
0081   REF  35  LAST 1152            5132  3 4672 0            CA     POSMAX
0082   REF 286  LAST 1186            5133  26 002 1            ADS    Q           CREATING OVERFLOW AND Q-1 IN Q
0083   REF  25  LAST 1187            5134  3 0006 1            CA     BBANK
00832                                 5135  0 0006 1            EXTEND
00834  REF  18  LAST 1187            5136  04 007 1            ROR    SUPERBNK
0084   REF 203  LAST 1190            5137  56 001 0            XCH    L

00849                                 5140  0 0004 C  WAITLIST  INHINT
0085   REF 287  LAST 1190            5141  56 002 C            XCH    Q           SAVE DELTA T IN Q AND RETURN IN
0086   REF   1                       5142  54 061 1            TS     WAITEXIT    WAITEXIT.
0087                                 5143  0 0006 1            EXTEND
0088   REF   2  LAST 1190            5144  5 0061 C            INDEX  WAITEXIT    IF TWIDDLING, THE TS SKIPS TO HERE
0089                                 5145  3 0001 C            DCA    0           PICK UP 2CADR OF TASK.
0090   REF   1                       5146  54 063 C  -1        TS     WAITADR     BBCON WILL REMAIN IN L
0091   REF   1                       5147  3 5155 C  DLY2      CAF    WAITBB      ENTRY FROM FIXDELAY AND VARDELAY.
0092   REF  26  LAST 1190            5150  56 006 1            XCH    BBANK
0093   REF   1                       5151  1 3246 C            TCF    WAIT2

R0094                 RETURN TC CALLER AFTER TASK INSERTION:

0095   REF   3  LAST 1190            5152  52 062 1  LVWTLIST  OXCH   WAITEXIT
0096   REF  64  LAST 1187            5153  6 4711 1            AD     TWO
0097                                 5154  52 006 C            DTCB

0099   REF  15  LAST 1190   E3,1400                            EBANK= LST1
0100   REF   2  LAST 1190            5155   02063 C  WAITBB    BBCON  WAIT2

R0101                 RETURN TC CALLER +2 AFTER WAITING DT SPECIFIED AT CALLER +1.

0102   REF 288  LAST 1190            5156  50 002 C  FIXDELAY  INDEX  Q           BOTH ROUTINES MUST BE CALLED UNDER
0103                                 5157  3 0000 1            CAF    0           WAITLIST CONTROL AND TERMINATE THE TASK
0104   REF 289  LAST 1190            5160  24 002 C            INCR   Q           IN WHICH THEY WERE CALLED.

R0105                 RETURN TC CALLER +1 AFTER WAITING THE DT AS ARRIVING IN A.

0106   REF 290  LAST 1190            5161  56 002 C  VARDELAY  XCH    Q           DT TO Q. TASK ADRES TO WAITADR.
0107   REF   2  LAST 1190            5162  54 063 C            TS     WAITADR
0108   REF  27  LAST 1190            5163  3 0006 1            CA     BBANK       BBANK IS SAVED DURING DELAY.
0109                                 5164  0 0006 1            EXTEND
0110   REF  19  LAST 1190            5165  04 007 1            ROR    SUPERBNK    ADD SBANK TO BBCON.
0111   REF 204  LAST 1190            5166  54 001 1            TS     L
0112   REF   1                       5167  3 5172 C            CAF    DELAYEX
0113   REF   4  LAST 1190            5170  54 061 1            TS     WAITEXIT    GO TO TASKOVER AFTER TASK ENTRY.
0114   REF   1                       5171  1 5147 1            TCF    DLY2
```

L WAITLIST USER'S PAGE NO. 4 E3 S3

0115 REF 56 LAST 1056 5172 1 5211 1 DELAYEX TCF TASKOVER -2 RETURNS TO TASKOVER

R0116 ENDTASK MUST BE ENTERED IN FIXED-FIXED SO IT IS DISTINGUISHABLE BY ITS ADRES ALONE.

```
0118  REF  16  LAST 1190   E3,1400                          EBANK= LST1
0119  REF   1               5173   72602 0  ENDTASK -2CADR  SVCT3
0119  REF   1               5174   73714 1

0120  REF  18  LAST 1035    5175   10 076 1  SVCT3   CCS     FLAGWRD2      DRIFT FLAG
0121  REF  57  LAST 1191    5176   1 5213 0          TCF     TASKOVER
0122  REF  58  LAST 1192    5177   1 5213 0          TCF     TASKOVER
0123                         5200   1 5201 0          TCF     +1

01231 REF   2  LAST  187     5201   11'322 1          CCS     IMUCADR       DON'T DO NBDONLY IF SOMEONE ELSE IS IN
01232 REF  59  LAST 1192     5202   1 5213 0          TCF     TASKOVER      IMUSTALL.
01233                        5203   1 5206 1          TCF     +3
01234 REF  60  LAST 1192     5204   1 5213 0          TCF     TASKOVER
01235 REF  61  LAST 1192     5205   1 5213 0          TCF     TASKOVER

0124  REF   1               5206   3 7672 0    +3    CAF     PRIO35        COMPENSATE FOR NBD COEFFICIENTS ONLY.
0125  REF  30  LAST  983     5207   0 5027 1          TC      NOVAC             ENABLE EVERY 81.93 SECONDS
0126  REF   7  LAST  773   E3,1460                          EBANK= NBDX
0127  REF   1               5210    03542 1           2CADR   NBDONLY
0127  REF   1               5211    14063 1
0128  REF  62  LAST 1192     5212   1 5213 0          TCF     TASKOVER
```

V41 N20 E

```
P0129                BEGIN TASK INSERTION.

 0130                                01,3246                        BANK   01
 0131  REF    1                                                     COUNT  01/WAIT

 0132  REF    1                     01,3246  54 062 1  WAIT2       TS     WAITBANK       BBANK OF CALLING PROGRAM.
 0133  REF    2  LAST  185          01,3247  4 0026 1              CS     TIME3
 0134  REF   27  LAST 1129          01,3250  6 4703 1              AD     BIT8           BIT 8 = OCT 200
 0135  REF  325  LAST 1186          01,3251  10 000 0              CCS    A              TEST 200 - C(TIME3).  IF POSITIVE,
A0136                                      IT MEANS THAT TIME3 OVERFLOW HAS OCCURRED PRIOR TO CS  TIME3 AND THAT
A0137                                      C(TIME3) = T - T1, INSTEAD OF 1.0 - (T1 - T).  THE FOLLOWING FOUR
A0138                                      ORDERS SET C(A) = TD - T1 + 1 IN EITHER CASE.

 0139  REF    2  LAST 1171          01,3252  6 6056 1              AD     OCT40001       OVERFLOW HAS OCCURRED.  SET C(A) =
 0140  REF  326  LAST 1193          01,3253  4 0000 0              CS     A              T - T1 + 1.0 - 201

R0141  NORMAL CASE (C(A) NNZ) YIELDS SAME C(A):  -( -(1.0-(T1-T)) + 200) - 1

 0142  REF    1                     01,3254  6 3402 1              AD     OCT40201
 0143  REF  291  LAST 119C          01,3255  6 0002 0              AD     Q              RESULT = TD - T1 + 1.

 0144  REF  327  LAST 1193          01,3256  10 000 0              CCS    A              TEST TD - T1 + 1

 0145  REF   17  LAST 1192          01,3257  6 1400 1              AD     LST1           IF TD - T1 POS, GO TO WTLST5 WITH
 0146  REF    1                     01,3260  1 3322 0              TCF    WTLST5         C(A) = (TD - T1) + C(LST1) = TD-T2+1

 0147                                01,3261  13 262 0              NOOP
 0148  REF  292  LAST 1193          01,3262  4 0002 1              CS     Q

R0149  NOTE THAT THIS PROGRAM SECTION IS NEVER ENTERED WHEN T-T1 G/E -1,
R0150  SINCE TD-T1+1 = (TD-T) + (T-T1+1), AND DELTA T = TD-T G/E +1 .  (G/E
R0151  SYMBOL MEANS GREATER THAN OR EQUAL TO).  THUS THERE NEED BE NO CON-
R0152  CERN OVER A PREVIOUS OR IMMINENT OVERFLOW OF TIME3 HERE.

 0153  REF    8  LAST 1054          01,3263  6 4675 1              AD     POS1/2         WHEN TD IS NEXT, FORM QUANTITY
 0154  REF    9  LAST 1193          01,3264  6 4675 1              AD     POS1/2           1.0 - DELTA T = 1.0 - (TD - T)
 0155  REF    3  LAST 1193          01,3265  56 026 0              XCH    TIME3
 0156  REF   12  LAST 1115          01,3266  6 4674 0              AD     NEGMAX
 0157  REF  293  LAST 1193          01,3267  6 0002 0              AD     Q              1.0 - DELTAT T NOW COMPLETE.
 0158                                01,3270  0 0006 1              EXTEND                ZERO INDEX Q.
 0159                                01,3271  22 007 0              QXCH   7              (ZQ)
```

```
0160   REF  18  LAST 1193   01,3272  57'400 1  WTLST4  XCH    LST1
0161   REF  19  LAST 1194   01,3273  57'401 0          XCH    LST1 +1
0162   REF  20  LAST 1194   01,3274  57'402 0          XCH    LST1 +2
0163   REF  21  LAST 1194   01,3275  57'403 1          XCH    LST1 +3
0164   REF  22  LAST 1194   01,3276  57'404 0          XCH    LST1 +4
0165   REF  23  LAST 1194   01,3277  57'405 1          XCH    LST1 +5
0166   REF  24  LAST 1194   01,3300  57'406 1          XCH    LST1 +6
0167   REF  25  LAST 1194   01,3301  57'407 0          XCH    LST1 +7

0168   REF   3  LAST 1190   01,3302  3 0063 1          CA     WAITADR     (MINOR PART OF TASK CADR HAS BEEN IN L.)
0169   REF 294  LAST 1193   01,3303  50 002 0          INDEX  Q
0170                        01,3304  1 3305 0          TCF    +1

0171   REF  19  LAST  186   01,3305  53'411 0          DXCH   LST2
0172   REF  20  LAST 1194   01,3306  53'413 1          DXCH   LST2 +2
0173   REF  21  LAST 1194   01,3307  53'415 1          DXCH   LST2 +4
0174   REF  22  LAST 1194   01,3310  53'417 0          DXCH   LST2 +6
0175   REF  23  LAST 1194   01,3311  53'421 0          DXCH   LST2 +8D
0176   REF  24  LAST 1194   01,3312  53'423 1          DXCH   LST2 +10D    AT END, CHECK THAT C(LST2+10) IS STD
0177   REF  25  LAST 1194   01,3313  53'425 1          DXCH   LST2 +12D
0178   REF  26  LAST 1194   01,3314  53'427 0          DXCH   LST2 +14D
0179   REF  27  LAST 1194   01,3315  53'431 1          DXCH   LST2 +16D
0180   REF   3  LAST  186   01,3316  6 5173 1          AD     ENDTASK        END ITEM, AS CHECK FOR EXCEEDING
A0181                                                                        THE LENGTH OF THE LIST.
0182                        01,3317  0 0006 1          EXTEND                DUMMY TASK ADRES SHOULD BE IN FIXED-
0183   REF   1              01,3320  1 5152 0          BZF    LVWTLIST       FIXED SO ITS ADRES ALONE DISTINGUISHES
0184   REF   1              01,3321  1 3375 1          TCF    WTABORT        IT.
```

```
0185  REF 328  LAST 1193   01,3322  10 000 C  WTLST5  CCS   A          TEST  TD - T2 + 1
0186  REF  26  LAST 1194   01,3323  6 1401 C          AD    LST1 +1
0187                       01,3324  1 3330 C          TCF   +4
0188  REF 144  LAST 1183   01,3325  6 4712 1          AD    ONE
0189  REF   1              01,3326  0 3403 C          TC    WTLST2
0190                       01,3327   00001 C          OCT   1

0191  REF 329  LAST 1195   01,3330  10 000 C  +4      CCS   A          TEST  TD - T3 + 1
0192  REF  27  LAST 1195   01,3331  6 1402 C          AD    LST1 +2
0193                       01,3332  1 3336 C          TCF   +4
0194  REF 145  LAST 1195   01,3333  6 4712 1          AD    ONE
0195  REF   2  LAST 1195   01,3334  0 3403 C          TC    WTLST2
0196                       01,3335   00002 C          OCT   2

0197  REF 330  LAST 1195   01,3336  10 000 C  +4      CCS   A          TEST  TD - T4 + 1
0198  REF  28  LAST 1195   01,3337  6 1403 1          AD    LST1 +3
0199                       01,3340  1 3344 C          TCF   +4
0200  REF 146  LAST 1195   01,3341  6 4712 1          AD    ONE
0201  REF   3  LAST 1195   01,3342  0 3403 C          TC    WTLST2
0202                       01,3343   00003 1          OCT   3

0203  REF 331  LAST 1195   01,3344  10 000 C  +4      CCS   A          TEST  TD - T5 + 1
0204  REF  29  LAST 1195   01,3345  6 1404 C          AD    LST1 +4
0205                       01,3346  1 3352 1          TCF   +4
0206  REF 147  LAST 1195   01,3347  6 4712 1          AD    ONE
0207  REF   4  LAST 1195   01,3350  0 3403 C          TC    WTLST2
0208                       01,3351   00004 C          OCT   4

0209  REF 332  LAST 1195   01,3352  10 000 C  +4      CCS   A          TEST  TD - T6 + 1
0210  REF  30  LAST 1195   01,3353  6 1405 1          AD    LST1 +5
0211                       01,3354  1 3360 C          TCF   +4
0212  REF 148  LAST 1195   01,3355  6 4712 1          AD    ONE
0213  REF   5  LAST 1195   01,3356  0 3403 C          TC    WTLST2
0214                       01,3357   00005 1          OCT   5

0215  REF 333  LAST 1195   01,3360  10 000 C  +4      CCS   A          TEST  TD - T7 + 1
0216  REF  31  LAST 1195   01,3361  6 1406 1          AD    LST1 +6
0217                       01,3362  1 3366 C          TCF   +4
0218  REF 149  LAST 1195   01,3363  6 4712 1          AD    ONE
0219  REF   6  LAST 1195   01,3364  0 3403 C          TC    WTLST2
0220                       01,3365   00006 1          OCT   6
```

```
0221  REF 334  LAST 1195  01,3366  10 000 C  +4        CCS   A
0222  REF  32  LAST 1195  01,3367  6 1407 C            AD    LST1 +7
0223                       01,3370  1 3374 C            TCF   +4
0224  REF 150  LAST 1195  01,3371  6 4712 1            AD    ONE
0225  REF   7  LAST 1195  01,3372  0 3403 C            TC    WTLST2
0226                       01,3373   00007 C           OCT   7

0227  REF 335  LAST 1196  01,3374  10 000 C  +4        CCS   A
0228  REF   6  LAST 1179  01,3375  0 5604 C  WTABORT   TC    BAILOUT     NO ROOM IN THE INN.
0229                       01,3376   01203 1           OCT   1203

0230  REF 151  LAST 1196  01,3377  6 4712 1            AD    ONE
0231  REF   8  LAST 1196  01,3400  0 3403 C            TC    WTLST2
0232                       01,3401   00010 C           OCT   10

0233                       01,3402   40201 C  CCT40201  OCT   40201
```

```
P0234   THE ENTRY TO WTLST2 JUST PRECEDING CCT  N  IS FOR T  LE TD LE T   -1.
R0235                                              N           N+1

R0236   (LE MEANS LESS THAN OR EQUAL TO).  AT ENTRY, C(A) = -(TD - T   + 1)
R0237                                                        N+1

R0238   THE LST1 ENTRY -(T   - T +1) IS TO BE REPLACED BY -(TD - T + 1), AND
R0239                  N+1   N                              N

R0240   THE ENTRY -(T   - TD + 1) IS TO BE INSERTED IMMEDIATELY FOLLOWING.
R0241             N+1

 0242   REF   1              01,3403  54 064 1  WTLST2  TS      WAITTEMP          C(A) = -(TD - T   + 1)
 0243   REF 295  LAST 1194   01,3404  50 002 C           INDEX   Q
 0244                        01,3405  3 0000 1           CAF     0
 0245   REF 296  LAST 1197   01,3406  54 002 1           TS      Q                 INDEX VALUE INTO Q.

 0246   REF 152  LAST 1196   01,3407  3 4712 1           CAF     ONE
 0247   REF   2  LAST 1197   01,3410  6 0064 C           AD      WAITTEMP
 0248   REF 297  LAST 1197   01,3411  50 002 C           INDEX   Q                 C(A) = -(TD - T ) + 1.
 0249   REF  33  LAST 1196   01,3412  27'377 1           ADS     LST1 -1                                N

 0250   REF   3  LAST 1197   01,3413  4 0064 1           CS      WAITTEMP
 0251   REF 298  LAST 1197   01,3414  50 002 C           INDEX   Q
 0252   REF   1              01,3415  1 3272 1           TCF     WTLST4

R0253   C(TIME3) = 1.0 - (T1 - T)

R0254   C(LST1  ) = - (T2 - T1) + 1
R0255   C(LST1+1) = - (T3 - T2) + 1
R0256   C(LST1+2) = - (T4 - T3) + 1
R0257   C(LST1+3) = - (T5 - T4) + 1
R0258   C(LST1+4) = - (T6 - T5) + 1

R0259   C(LST2   ) = 2CADR  TASK1
R0260   C(LST2+2 ) = 2CADR  TASK2
R0261   C(LST2+4 ) = 2CADR  TASK3
R0262   C(LST2+6 ) = 2CADR  TASK4
R0263   C(LST2+8 ) = 2CADR  TASK5
R0264   C(LST2+10) = 2CADR  TASK6
```

P0265 ENTERS HERE ON T3 RUPT TO DISPATCH WAITLISTED TASK.

```
0266                          01,3416  0 0006 1  T3RUPT   EXTEND
0267  REF  20  LAST 1190     01,3417  04 007 1           ROR     SUPERBNK      READ CURRENT SUPERBANK VALUE AND
0268  REF  22  LAST 1063     01,3420  54 016 1           TS      BANKRUPT      SAVE WITH E AND F BANK VALUES.
0269                          01,3421  0 0006 1           EXTEND
0270  REF  18  LAST 1063     01,3422  22 012 1           QXCH    QRUPT

0271  REF   9  LAST 1167     01,3423  3 4673 1  T3RUPT2  CAF     NEG1/2        DISPATCH WAITLIST TASK.
0272  REF  34  LAST 1197     01,3424  57'407 0           XCH     LST1 +7
0273  REF  35  LAST 1198     01,3425  57'406 1           XCH     LST1 +6
0274  REF  36  LAST 1198     01,3426  57'405 1           XCH     LST1 +5
0275  REF  37  LAST 1198     01,3427  57'404 0           XCH     LST1 +4       1.  MOVE UP LST1 CONTENTS, ENTERING
0276  REF  38  LAST 1198     01,3430  57'403 1           XCH     LST1 +3           A VALUE OF 1/2 +1 AT THE BOTTOM
0277  REF  39  LAST 1198     01,3431  57'402 0           XCH     LST1 +2           FOR T6-T5, CORRESPONDING TO THE
0278  REF  40  LAST 1198     01,3432  57'401 0           XCH     LST1 +1           INTERVAL 81.91 SEC FOR ENDTASK.
0279  REF  41  LAST 1198     01,3433  57'400 1           XCH     LST1
0280  REF  36  LAST 1190     01,3434  6 4672 0           AD      POSMAX        2. SET T3 = 1.0 - T2 -T USING LIST 1.
0281  REF   4  LAST 1193     01,3435  26 026 1           ADS     TIME3         SO T3 WONT TICK DURING UPDATE.
0282  REF   3  LAST  575     01,3436  54 734 0           TS      RUPTAGN
0283  REF 244  LAST 1187     01,3437  4 4714 0           CS      ZERO
0284  REF   4  LAST 1198     01,3440  54 734 0           TS      RUPTAGN       SETS RUPTAGN TO +1 ON OVERFLOW.

0285                          01,3441  0 0006 1           EXTEND                DISPATCH TASK.
0286  REF   4  LAST 1194     01,3442  4 5174 1           DCS     ENDTASK
0287  REF  28  LAST 1194     01,3443  53'431 1           DXCH    LST2 +16D
0288  REF  29  LAST 1198     01,3444  53'427 0           DXCH    LST2 +14D
0289  REF  30  LAST 1198     01,3445  53'425 1           DXCH    LST2 +12D
0290  REF  31  LAST 1198     01,3446  53'423 1           DXCH    LST2 +10D
0291  REF  32  LAST 1198     01,3447  53'421 0           DXCH    LST2 +8D
0292  REF  33  LAST 1198     01,3450  53'417 0           DXCH    LST2 +6
0293  REF  34  LAST 1198     01,3451  53'415 1           DXCH    LST2 +4
0294  REF  35  LAST 1198     01,3452  53'413 1           DXCH    LST2 +2
0295  REF  36  LAST 1198     01,3453  53'411 0           DXCH    LST2

0296  REF 205  LAST 1190     01,3454  56 001 0           XCH     L
0297                          01,3455  0 0006 1           EXTEND
0298  REF  21  LAST 1198     01,3456  01 007 1           WRITE   SUPERBNK      SET SUPERBANK FROM BBCON OF 2CADR
0299  REF 206  LAST 1198     01,3457  56 001 0           XCH     L             RESTORE TO L FOR DXCH Z.
0300                          01,3460  52 006 0           DTCB
```

```
P0301           RETURN, AFTER EXECUTION OF T3 OVERFLOW TASK:

 0302                                5213                    BLOCK   02
 0303   REF   2 LAST 1190 TO 1193:    51    51*              COUNT   02/WAIT

 0304   REF   5  LAST 1198          5213  10 734 C  TASKOVER CCS     RUPTAGN       IF +1 RETURN TO T3RUPT, IF -0 RESUME.
 0305   REF   2  LAST 1190          5214  3 5155 C            CAF     WAIT88
 0306   REF  28  LAST 1190          5215  54 006 C            TS      BBANK
 0307   REF   1                     5216  1 3423 C            TCF     T3RUPT2       DISPATCH NEXT TASK IF IT WAS DUE.

 0308   REF  23  LAST 1198          5217  3 0016 C            CA      BANKRUPT
 0309                               5220  0 0006 1            EXTEND
 0310   REF  22  LAST 1198          5221  01 007 1            WRITE   SUPERBNK      RESTORE SUPERBANK BEFORE RESUME IS DONE

 0311                               5222  0 0006 1  RESUME    EXTEND
 0312   REF  19  LAST 1198          5223  22 012 1            QXCH    QRUPT
 0313   REF  24  LAST 1199          5224  3 0016 C  NOQRSM    CA      BANKRUPT
 0314   REF  29  LAST 1199          5225  56 006 1            XCH     BBANK
 0315   REF  11  LAST  127          5226  52 011 C  NOQBRSM   DXCH    ARUPT
 03155                              5227  0 0003 1            RELINT
 0316                               5230  5 0017 1            RESUME
```

```
P0317   LONGCALL

R0318   PROGRAM DESCRIPTION                          DATE- 17 MARCH 1967
R0319   PROGRAM WRITTEN BY W.H. VANDEVER             LOG SECTION WAITLIST
R0320   MCD BY- R. MELANSON TO ADD DOCUMENTATION     ASSEMBLY SUNDISK REV. 100

R0321   FUNCTIONAL DESCRIPTION-
R0322   LONGCALL IS CALLED WITH THE DELTA TIME ARRIVING IN A,L SCALED AS TIME2,TIME1 WITH THE 2CADR OF THE TASK
R0324   IMMEDIATELY FOLLOWING THE TC LONGCALL.  FOR EXAMPLE, IT MIGHT BE DONE AS FOLLOWS WHERE TIMELOC IS THE NAME OF
R0326   A DP REGISTER CONTAINING A DELTA TIME AND WHERE TASKTODO IS THE NAME OF THE LOCATION AT WHICH LONGCALL IS TO
R0328   START

R0329   CALLING SEQUENCE-
A0330                                       EXTEND
A0331                                       DCA     TIMELOC
A0332                                       TC      LONGCALL
A0333                                       2CADR   TASKTODO

R0334   NORMAL EXIT MODE-
R0335      1). TC    WAITLIST
R0336      2). CIOF  (TO L+3 OF CALLING ROUTINE 1ST PASS THRU LONGCYCL)
R0337      3). CIOF  (TO TASKOVER ON SUBSEQUENT PASSES THRU LONGCYCL)

R0338   ALARM OR ABORT EXIT MODE-
R0339      NONE

R0340   OUTPUT-
R0341      LONGTIME AND LONGTIME+1 = DELTA TIME
R0342      LONGEXIT AND LONGEXIT+1 = RETURN 2CADR
R0343      LONGCADR AND LONGCADR+1 = TASK 2CADR
R0344      A = SINGLE PRECISION TIME FOR WAITLIST

R0345   ERASABLE INITIALIZATION-
R0346      A = MOST SIGNIFICANT PART OF DELTA TIME
R0347      L = LEAST SIGNIFICANT PART OF DELTA TIME
R0348      Q = ADDRESS OF 2CADR TASK VALUE

R0349   DEBRIS-
R0350      A,Q,L
R0351      LONGCADR AND LONGCADR+1
R0352      LONGEXIT AND LONGEXIT+1
R0353      LONGTIME AND LONGTIME+1

R0354   *** THE FOLLOWING IS TO BE IN FIXED-FIXED AND UNSWITCHED ERRASIBLE ***

 0355                          5231                        BLOCK  02
 0356   REF  42  LAST 1198   E3,1400                      EBANK= LST1
 0357   REF   1               5231  53*140 1  LONGCALL DXCH   LONGTIME        OBTAIN THE DELTA TIME

 0358                          5232  0 0006 1            EXTEND                OBTAIN THE 2CADR
```

```
0359   REF 299  LAST 1197      5233  5 0002 C            NDX     Q
0360                          5234  3 0001 C            DCA     0
0361   REF   1                5235  53'134 1            DXCH    LONGCADR

0362                          5236  0 0006 1            EXTEND                  NOW GO TO THE APPROPRIATE SWITCHED BANK
0363   REF   1                5237  3 5242 0            DCA     LGCL2CDR        FOR THE REST OF LONGCALL
0364                          5240  52 006 C            DTCB

0365   REF  43  LAST 1200  E3,1400                      EBANK=  LST1
0366   REF   1                5241   03461 1  LGCL2CDR 2CADR   LNGCALL2
0366   REF   1                5242   02063 C

R0367  *** THE FOLLOWING MAY BE IN A SWITCHED BANK, INCLUDING ITS ERASABLE ***

0368                       01,3461                      BANK    01
0369   REF   2 LAST 1193 TC 1199:   139   139*         COUNT   01/WAIT

0370   REF   1              01,3461  23'435 1  LNGCALL2 LXCH    LONGEXIT +1     SAVE THE CORRECT BB FOR RETURN
0371   REF  69  LAST 1190   01,3462  3 4711 1            CA      TWO             OBTAIN THE RETURN ADDRESS
0372   REF 300  LAST 1201   01,3463  26 002 1            ADS     Q
0373   REF   2  LAST 1201   01,3464  55'434 1            TS      LONGEXIT

R0374          *** WAITLIST TASK LONGCYCL ***
0375                       01,3465  0 0006 1  LONGCYCL EXTEND                  CAN WE SUCCESFULLY TAKE ABOUT 1.25
0376   REF   1              01,3466  4 3477 1            DCS     DPBIT14         MINUTES OFF OF LONGTIME
0377   REF   2  LAST 1200   01,3467  21'140 1            DAS     LONGTIME

0378   REF   3  LAST 1201   01,3470  11'140 1            CCS     LONGTIME +1     THE REASONIBG BEHIND THIS PART IS
0379   REF   1              01,3471  1 3510 1            TCF     MUCHTIME        INVOLVED, TAKING INTO ACCOUNT THAT THE
A0380                                                                           WORDS MAY NOT BE SIGNED CORRECTED (DP
A0381                                                                           BASIC INSTRUCTICNS
A0382                                                                           DO NOT SIGN CORRECT) AND THAT WE SUBTRAC
A0383                                                                           TED BIT14 (1 OVER HALF THE POS. VALUE
A0384                                                                           REPRESENTIBLE IN SINGLE WORD)
0385                       01,3472  13 473 C            NOOP                    CAN:T GET HERE    **********
0386                       01,3473  1 3474 1            TCF     +1
0387   REF   4  LAST 1201   01,3474  11'137 1            CCS     LONGTIME
0388   REF   2  LAST 1201   01,3475  1 3510 1            TCF     MUCHTIME
0389                       01,3476   00000 1  DPBIT14   OCT     00000
0390                       01,3477   20000 C            OCT     20000

A0391                                                                           LONGCALL
0392   REF  71  LAST 1171   01,3500  3 4675 1  LASTTIME CA      BIT14           GET BACK THE CORRECT DELTA TFOR WAITLIST
0393   REF   5  LAST 1201   01,3501  27'140 1            ADS     LONGTIME +1
0395   REF  49  LAST 1059   01,3502  0 5140 1            TC      WAITLIST
0396   REF  44  LAST 1201   E3,1400                      EBANK=  LST1
0397   REF   1              01,3503   03515 C            2CADR   GETCADR         THE ENTRY TO OUR LONGCADR
0397   REF   1              01,3504   02063 C

0399   REF   1              01,3505  3 3517 1  LONGRTRN CA      TSKOVCDR        SET IT UP SO THAT ONLY THE FIRST EXIT IS
```

L WAITLIST USER'S PAGE NO. 15 E3 S3

```
0400   REF   3  LAST 1201   01,3506  53'435 C            DXCH   LONGEXIT        TO THE CALLER OF LONGCALL
0401                        01,3507  52 006 C            DTCB                   THE REST ARE TO TASKOVER

0402   REF  72  LAST 1201   01,3510  3 4675 1  MUCHTIME CA     BIT14           WE HAVE OVER CUR ABOUT 1.25 MINUTES
0404   REF  50  LAST 1201   01,3511  0 5140 1            TC     WAITLIST        SO SET UP FOR ANOTHER CYCLE THROUGH HERE
0405   REF  45  LAST 1201   E3,1400                     EBANK= LST1
0406   REF   1              01,3512   03465 C            2CADR  LONGCYCL
0406   REF   1              01,3513   02063 C

0408   REF   1              01,3514  1 3505 C            TCF    LONGRTRN        NOW EXIT PROPERLY

R0409                *** WAITLIST TASK  GETCADR ***
0410   REF   2  LAST 1201   01,3515  53'134 1  GETCADR  DXCH   LONGCADR        GET THE LONGCALL THAT WE WISHED TO START
0411                        01,3516  52 006 C            DTCB                   AND TRANSFER CONTROL TO IT

0412   REF  63  LAST 1192   01,3517   05213 1  TSKOVCDR GENADR TASKOVER
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L LATITUDE LONGITUDE SUBROUTINES USER'S PAGE NO. I EO S3

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R0001   SUBROUTINE TO CONVERT RAD VECTOR AT GIVEN TIME TO LAT,LONG AND ALT

R0002   CALLING SEQUENCE

R0003     L-1    CALL
R0004     L              LAT-LONG
R0005   SUBROUTINES USED

R0006    R-TO-RP,ARCTAN,SETGAMMA,SETRE
R0007   ERASABLE INIT. REQ.

R0008     AXO,-AYO,AZO,TEPHEM (SET AT LAUNCH TIME)
R0009   ALPHAV = POSITION VECTOR METERS B-29
R0010     MPAC-- TIME  (CSECS B-28)
R0011    ERADFLAG =1, TO COMPUTE EARTH RADIUS, =0 FOR FIXED EARTH RADIUS
R0012    LUNAFLAG=0 FOR EARTH,1 FOR MOON
R0013   OUTPUT

R0014     LATITUDE IN LAT   (REVS. B-0)
R0015     LONGITUDE IN LONG   (REVS. B-0)
R0016   ALTITUDE IN ALT METERS B-29
 0017                        30,3776                          BANK   30
 0018   REF   1              13,2000                          SETLOC LATLONG
 0019                        13,2322                          BANK
 0020   REF   1                                               COUNT  13/LT-LG

 0021   REF  19 LAST  891    E4,1551                          EBANK= ALPHAV
 0022                        13,2322  40220 0  LAT-LONG STQ    SETPD
 0023   REF   1              13,2323  02242 1                 INCORPEX
 0024                        13,2324  00001 0                 DD
 0025                        13,2325  24007 0         STOVL   6D              SAVE TIME IN 6-7D FOR R-TO-RP
 0026   REF  20 LAST 1203    13,2326  02152 0                 ALPHAV
 0027                        13,2327  51406 1         PUSH    ABVAL           0-5D= R FOR R-TO-RP
 0028   REF   2 LAST   87    13,2330  16310 1         STODL   ALPHAM          ABS. VALUE OF R FOR ALT FORMULA BELOW
 0029   REF   6 LAST 1173    13,2331  11453 0                 ZEROVEC         SET MPAC=0 FOR EARTH,NON-ZERO FOR MOON
 0030                        13,2332  71414 0         BOFF    COS             USE COS(0) TO GET NON-ZERO IN MPAC
 0031   REF  24 LAST  891    13,2333  01743 0                 LUNAFLAG        0=EARTH,1=MOON
 0032   REF   1              13,2334  26335 0                 CALLRTRP
 0033                        13,2335  77624 1  CALLRTRP CALL
 0034   REF   3 LAST  597    13,2336  55366 1                 R-TO-RP         RP VECTOR CONVERTED FROM R B-29
 0035                        13,2337  77656 1         UNIT                    UNIT RP B-1
 0036   REF  21 LAST 1203    13,2340  36152 1         STCALL  ALPHAV          U2= 1/2 SINL FOR SETRE SUBR BELOW
 0037   REF   1              13,2341  26523 1                 SETGAMMA         SET GAMMA=B2/A2 FOR EARTH,=1 FOR MOON
 0038                        13,2342  77624 1         CALL                     SCALED B-1
 0039   REF   2 LAST  590    13,2343  26533 0                 SETRE           CALC RE METERS B-29
 0040                        13,2344  63545 0         DLOAD   DSQ
 0041   REF  22 LAST 1203    13,2345  02152 0                 ALPHAV
 0042                        13,2346  63525 0         PDDL    DSQ
 0043   REF  23 LAST 1203    13,2347  02154 0                 ALPHAV +2
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0044                          13,2350  75415 C   DAD     SQRT
0045                          13,2351  76405 1   DMP     SL1R
0046  REF   1                13,2352  00011 1           GAMRP
0047  REF   5  LAST  835      13,2353  14021 1   STODL   COSTH       COS(LAT) B-1
0048  REF  24  LAST 1203      13,2354  02156 1           ALPHAV +4
0049  REF   5  LAST  835      13,2355  34023 1   STCALL  SINTH       SIN(LAT) B-1
0050  REF   1                13,2356  26463 1           ARCTAN
0051  REF  14  LAST  887      13,2357  15104 C   STODL   LAT         LAT BO
0052  REF  25  LAST 1204      13,2360  02152 C           ALPHAV
0053  REF   6  LAST 1204      13,2361  14021 1   STODL   COSTH       COS(LONG) B-1
0054  REF  26  LAST 1204      13,2362  02154 C           ALPHAV +2
0055  REF   6  LAST 1204      13,2363  34023 1   STCALL  SINTH       SIN(LONG) B-1
0056  REF   2  LAST 1204      13,2364  26463 1           ARCTAN
0057  REF  10  LAST  886      13,2365  15106 1   STODL   LONG        LONG. REVS B-0 IN RANGE -1/2 TO 1/2
0058  REF   3  LAST 1203      13,2366  02310 1           ALPHAM
0059                          13,2367  77625 C   DSU                 ALT= R-RE METERS B-29
0060  REF   7  LAST  761      13,2370  02241 1           ERADM
0061  REF   7  LAST  632      13,2371  35110 1   STCALL  ALT         EXIT WITH ALT METERS B-29
0062  REF   2  LAST 1203      13,2372  02242 1           INCORPEX
```

L LATITUDE LONGITUDE SUBROUTINES USER'S PAGE NO. 3 E4 S3

R0063 SUBROUTINE TO CONVERT LAT,LONG,ALT AT GIVEN TIME TO RADIUS VECTOR
R0064 CALLING SEQUENCE

R0065 L-1 CALL
R0066 1 LALOTORV
R0067 SUBROUTINES USED

R0068 SETGAMMA,SETRE,RP-TO-R
R0069 ERASABLE INIT. REQ.

R0070 AXC,AYC,AZC,TEPHEM SET AT LAUNCH TIME
R0071 LAT-- LATITUDE (REVS B0)
R0072 LONG-- LONGITUDE (REVS B0)
R0073 ALT--ALTITUDE (METERS) B-29
R0074 MEAC-- TIME (CSECS B-28)
R0075 ERADFLAG =1 TO COMPUTE EARTH RADIUS, =0 FOR FIXED EARTH RADIUS
R0076 LUNAFLAG=0 FOR EARTH,1 FOR MOON
R0077 OUTPUT

R0078 R-VECTOR IN ALPHAV (METERS B-29)

0079				13,2373	40220 0	LALOTORV	STQ	SETPD	LAT,LONG,ALT TO R VECTOR
0080	REF 3	LAST	1204	13,2374	02242 1			INCRPEX	
0081				13,2375	00001 0			0D	
0082				13,2376	34007 1		STCALL	6D	6-7D= TIME FOR RP-TO-R
0083	REF 2	LAST	1203	13,2377	26523 1			SETGAMMA	GAMMA=B2/A2 FOR EARTH,1 FOR MOON B-1
0084				13,2400	73545 1		DLOAD	SIN	COS(LONG)COS(LAT) IN MPAC
0085	REF 15	LAST	1204	13,2401	01104 0			LAT	UNIT RP= SIN(LONG)COS(LAT) 2-3D
0086				13,2402	65275 1		DMPR	PDDL	PD 2 GAMMA*SIN(LAT) 0-1D
0087	REF 2	LAST	1204	13,2403	00011 1			GAMRP	
0088	REF 16	LAST	1205	13,2404	01104 0			LAT	0-1D= GAMMA*SIN(LAT) B-2
0089				13,2405	65346 0		COS	PDDL	PD 4 2-3D=COS(LAT) B-1 TEMPORARILY
0090	REF 11	LAST	1204	13,2406	01106 1			LONG	
0091				13,2407	57356 0		SIN	DMPR	PD 2
0092				13,2410	71525 0		PDDL	COS	PD 4 2-3D=SIN(LONG)COS(LAT) B-2
0093	REF 17	LAST	1205	13,2411	01104 0			LAT	
0094				13,2412	71525 0		PDDL	COS	PD 6 4-5D=COS(LAT) B-1 TEMPORARILY
0095	REF 12	LAST	1205	13,2413	01106 1			LONG	
0096				13,2414	55475 1		DMPR	VDEF	PD 4 MPAC= COS(LONG)COS(LAT) B-2
0097				13,2415	41456 0		UNIT	PUSH	0-5D= UNIT RP FOR RP-TO-R SUBR.
0098	REF 27	LAST	1204	13,2416	36152 1		STCALL	ALPHAV	ALPHAV +4= SINL FOR SETRE SUBR.
0099	REF 3	LAST	1203	13,2417	26533 0			SETRE	RE METERS B-29
0100				13,2420	43145 0		DLOAD	BOFF	SET MPAC=0 FOR EARTH,NON-ZERO FOR MOON
0101	REF 7	LAST	1203	13,2421	11453 0			ZEROVEC	
0102	REF 25	LAST	1203	13,2422	01743 0			LUNAFLAG	
0103	REF 1			13,2423	26425 0			CALLRPRT	
0104				13,2424	77746 1		COS		USE COS(0) TO GET NON-ZERO IN MPAC
0105				13,2425	77624 1	CALLRPRT	CALL		
0106	REF 7	LAST	891	13,2426	55341 1			RP-TO-R	EXIT WITH UNIT R VECTOR IN MPAC
0107	REF 28	LAST	1205	13,2427	16152 0		STODL	ALPHAV	
0108	REF 8	LAST	1204	13,2430	02241 1			ERADM	

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 0109                          13,2431   74215 1          DAD     VXSC            (RE + ALT)(UNIT R) METERS B-30
 0110   REF    8  LAST 1204    13,2432   01110 0                  ALT
 0111   REF   29  LAST 1209    13,2433   02152 0                  ALPHAV
 0112                          13,2434   77772 0          VSL1                    R METERS B-29
 0113   REF   30  LAST 1206    13,2435   36152 1          STCALL  ALPHAV          EXIT WITH R IN METERS B-29
 0114   REF    4  LAST 1209    13,2436   02242 1                  INCORPEX
R0115   SUBROUTINE TO COMPUTE EARTH RADIUS

R0116   INPUT

R0117     1/2 SIN LAT IN ALPHAV +4

R0118   OUTPUT

R0119     EARTH RADIUS IN ERADM AND MPAC  (METERS B-29)

 0120                          13,2437   63545 0  GETERAD  DLOAD   DSQ
 0121   REF   31  LAST 1206    13,2440   02156 1                   ALPHAV +4       SIN**2(L)
 0122                          13,2441   44352 0          SL1     BDSU
 0123   REF    1               13,2442   11451 1                  DP1/2           COS**2(L)
 0124                          13,2443   44275 1          DMPR    BDSU
 0125   REF    1               13,2444   26460 1                  EE
 0126   REF    2  LAST 1206    13,2445   11451 1                  DP1/2
 0127                          13,2446   75465 1          BDDV    SQRT
 0128   REF    1               13,2447   26454 0                  B2XSC
 0129                          13,2450   77622 1          SR4R
 0130   REF    9  LAST 1205    13,2451   02241 1          STORE   ERADM
 0131                          13,2452   77616 0          RVQ

R01311  THE FOLLOWING CONSTANTS WERE COMPUTED WITH A=6378166,B=6356784 METERS
R01312  B2XSC= B**2 SCALED B-51
R01313  B2/A2= B**2/A**2 SCALED B-1
R01314  EE=(1-B**2/A**2) SCALED B-0
 0132                          13,2453   00446 1  B2XSC    2DEC    .0179450689     B**2 SCALED B-51
 0132                          13,2454   00305 1
 0133   REF    4  LAST 1173    04,3450            DP1/2    =       XUNIT
 0134                          13,2455   17711 0  B2/A2    2DEC    .9933064884 B-1 GAMMA= B**2/A**2 B-1
 0134                          13,2456   05254 1
 0135                          13,2457   00155 0  EE       2DEC    6.6935116 E-3   (1-B**2/A**2) B-0
 0135                          13,2460   25250 1
 0136                          13,2461   00302 0  ERAD     2DEC    6373338 B-29    PAD RADIUS
 0136                          13,2462   17755 0
```

P0137 ARCTAN SUBROUTINE

R0138 CALLING SEQUENCE

R0139 SIN THETA IN SINTH B-1
R0140 COS THETA IN COSTH B-1
R0141 CALL ARCTAN

R0142 OUTPUT
R0143 ARCTAN THETA IN MPAC AND THETA B-0 IN RANGE -1/2 TO +1/2

```
0144                          13,2463  77600 1  ARCTAN   BOV
0145  REF  1                 13,2464  26465 1           CLROVFLW
0146                          13,2465  63545 C  CLROVFLW DLOAD  DSQ
0147  REF  7  LAST 1204       13,2466  00023 C           SINTH
0148                          13,2467  63525 C           PDDL   DSQ
0149  REF  7  LAST 1204       13,2470  00021 1           COSTH
0150                          13,2471  77615 C           DAD
0151                          13,2472  75454 C           BZE    SQRT
0152  REF  1                 13,2473  26511 C           ARCTANXX       ATAN=0/0  SET THETA=0
0153                          13,2474  40065 C           BODV   BOV
0154  REF  8  LAST 1207       13,2475  00023 C           SINTH
0155  REF  1                 13,2476  26516 1           ATAN=90
0156                          13,2477  67542 C           SR1    ASIN
0157  REF  4  LAST  712       13,2500  00025 C           STORE  THETA
0158                          13,2501  50125 1           PDDL   BMN
0159  REF  8  LAST 1207       13,2502  00021 1           COSTH
0160  REF  1                 13,2503  26505 C           NEGCOS
0161                          13,2504  43545 1           DLOAD  RVQ
0162                          13,2505  57545 1  NEGCOS   DLOAD  DCOMP
0163                          13,2506  43244 1           BPL    DAD
0164  REF  1                 13,2507  26513 1           NEGOUT
0165  REF  3  LAST 1206       13,2510  11451 1           DP1/2
0166  REF  5  LAST 1207       13,2511  00025 C  ARCTANXX STORE  THETA
0167                          13,2512  77616 C           RVQ

0168                          13,2513  52025 1  NEGOUT   DSU    GOTO
0169  REF  4  LAST 1207       13,2514  11451 1           DP1/2
0170  REF  2  LAST 1207       13,2515  26511 C           ARCTANXX
0171                          13,2516  75345 1  ATAN=90  DLOAD  SIGN
0172  REF  1                 13,2517  11477 C           LODP1/4
0173  REF  9  LAST 1207       13,2520  00023 C           SINTH
0174  REF  6  LAST 1207       13,2521  00025 C           STORE  THETA
0175                          13,2522  77616 C           RVQ

0176  REF  2  LAST  705       C4,3452          2DZERO   =      DPZERO
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P0177   ..... SETGAMMA SUBROUTINE .....
R0178   SUBROUTINE TO SET GAMMA FOR THE LAT-LONG AND LALOTORV SUBROUTINES

R0179    GAMMA = B**2/A**2 FOR EARTH (B-1)
R0180    GAMMA = 1 FOR MOON (B-1)

R0181   CALLING SEQUENCE
R0182    L       CALL
R0183    L+1             SETGAMMA

R0184   INPUT
R0185    LUNAFLAG=0 FOR EARTH,=1 FOR MOON

R0186   OUTPUT
R0187    GAMMA IN GAMRP  (B-1)

 0188                           13,2523   43145 C  SETGAMMA DLOAD  BOFF            BRANCH FOR EARTH
 0189   REF   1                 13,2524   26456 1                 B2/A2           EARTH GAMMA
 0190   REF  26  LAST 1205      13,2525   01743 C                 LUNAFLAG
 0191   REF   1                 13,2526   26531 1                 SETGMEX
 0192                           13,2527   77735 C          SLOAD
 0193   REF   1                 13,2530   11451 1                 1B1             MOON GAMMA
 0194   REF   3  LAST 1205      13,2531   00011 1  SETGMEX  STORE  GAMRP
 0195                           13,2532   77616 C          RVQ
 0196                    0010           GAMRP    =      8D
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P0197   .....SETRE SUBROUTINE .....
R0198   SUBROUTINE TO SET RE (EARTH OR MOON RADIUS)

R0199   RE= RM FOR MOON
R0200    RE= RREF FOR FIXED EARTH RADIUS OR COMPUTED RF FOR FISCHER ELLIPSOID

R0201   CALLING SEQUENCE
R0202    L        CALL
R0203    L+1              SETRE

R0204   SUBROUTINES USED
R0205    GETERAD

R0206   INPUT
R0207    ERADFLAG=0 FOR FIXED RE, 1 FOR COMPUTED RE
R0208    ALPHAV +4= 1/2 SINL IF GETERAD IS CALLED
R0209    LUNAFLAG=0 FOR EARTH,=1 FOR MOON

R0210   OUTPUT
R0211    ERADM= 504RM FOR MOON (METERS B-29)
R0212    ERADM= ERAD OR COMPUTED RF FOR EARTH (METERS B-29)

 0213                        13,2533   71220 1  SETRE    STQ     DLOAD
 0214   REF   1              13,2534   00051 0                   SETREX
 0215   REF   1              13,2535   26560 0                   504RM
 0216                        13,2536   71214 0          BON      DLOAD     BRANCH FOR MOON
 0217   REF  27  LAST 1208   13,2537   01703 1                   LUNAFLAG
 0218   REF   1              13,2540   26550 0                   TSTRLSRM
 0219   REF   1              13,2541   26462 0                   ERAD
 0220                        13,2542   45014 0          BOFF     CALL      ERADFLAG=0 FOR FIXED RE,1 FOR COMPUTED
 0221   REF  14  LAST  887   13,2543   00742 0                   ERADFLAG
 0222   REF   1              13,2544   26546 1                   SETRXX
 0223   REF   4  LAST  843   13,2545   26437 0                   GETERAD
 0224   REF  10  LAST 1206   13,2546   36241 0  SETRXX  STCALL   ERADM     EXIT WITH RE OR RM METERS B-29
 0225   REF   2  LAST 1209   13,2547   00051 0                   SETREX
 0226                        13,2550   77214 0  TSTRLSRM BON     VLOAD     ERADFLAG=0,SET RO=RLS
 0227   REF  15  LAST 1209   13,2551   00702 1                   ERADFLAG        =1     RO=RM
 0228   REF   2  LAST 1209   13,2552   26546 1                   SETRXX
 0229   REF   9  LAST  886   13,2553   02026 1                   RLS
 0230                        13,2554   64446 0          ABVAL    SR2R      SCALE FROM B-27 TO B-29
 0231                        13,2555   77650 1          GOTO
 0232   REF   3  LAST 1209   13,2556   26546 1                   SETRXX
 0233   REF  12  LAST  705     0051              SETREX   =       S2
 0234                        13,2557   00065 1  504RM    2DEC    1738090 B-29    METERS B-29 (MOON RADIUS)
 0234                        13,2560   01265 1
```

```
P0001   ..... RP-TO-R SUBROUTINE .....
R0002   SUBROUTINE TO CONVERT RP (VECTOR IN PLANETARY COORDINATE SYSTEM,EITHER
R0003    EARTH-FIXED OR MOON-FIXED) TO R (SAME VECTOR IN THE BASIC REF. SYSTEM)

R0004    R=MT(T)*(RP+LPXRP)    MT= M MATRIX TRANSPOSE

R0005   CALLING SEQUENCE
R0006    L       CALL
R0007    L+1             RP-TO-R

R0008   SUBROUTINES USED
R0009    EARTHMX,MOONMX,EARTHL

R0010      ITEMS AVAILABLE FROM LAUNCH DATA
R0011       504LM= THE LIBRATION VECTOR L OF THE MOON AT TIME TIMSUBL,EXPRESSED
R0012       IN THE MOON-FIXED COORD. SYSTEM   RADIANS  B0
R0013         ITEMS NECESSARY FOR SUBR. USED (SEE DESCRIPTION OF SUBR.)

R0014   INPUT
R0015    MPAC= 0 FOR EARTH,NON-ZERO FOR MOON
R0016    0-5D= RP VECTOR
R0017    6-7D= TIME

R0018   OUTPUT
R0019    MPAC= R VECTOR METERS B-29 FOR EARTH, B-27 FOR MOON

0020   REF   1                26,2000                        SETLOC PLANTIN
0021                          26,3341                        BANK

0022   REF   1                                               COUNT* $$/LUROT

0023                          26,3341   46020 1  RP-TO-R     STQ     BHIZ
0024   REF   1                26,3342   00050 1                    RPREXIT
0025   REF   1                26,3343   55356 1                    RPTORA
0026                          26,3344   77624 1            CALL                    COMPUTE M MATRIX FOR MOON
0027   REF   1                26,3345   55416 1                    MOONMX          LP=LM FOR MOON  RADIANS B0
0028                          26,3346   77775 1            VLOAD
0029   REF   1                26,3347   02012 0                    504LM
0030                          26,3350   53235 0  RPTORB    VXV     VAD
0031   REF   1                26,3351   00001 0                    504RPR
0032   REF   2  LAST 1210     26,3352   00001 0                    504RPR
0033                          26,3353   52105 1            VXM     GOTO
0034   REF   1                26,3354   00025 0                    MMATRIX         MPAC=R=MT(T)*(RP+LPXRP)
0035   REF   1                26,3355   55404 1                    RPRPXXXX        RESET PUSHLOC TO 0 BEFORE EXITING
0036                          26,3356   77624 1  RPTORA    CALL                    EARTH COMPUTATIONS
0037   REF   1                26,3357   55570 0                    EARTHMX         M MATRIX B-1
0038                          26,3360   77624 1            CALL
0039   REF   1                26,3361   55622 1                    EARTHL          L VECTOR RADIANS B0
0040                          26,3362   76521 0            MXV     VSL1            LP=M(T)*L  RAD B-0
0041   REF   2  LAST 1210     26,3363   00025 0                    MMATRIX
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0042                        26,3364   77650 1          GOTO
0043   REF   1              26,3365   55350 1                   RPTORB
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R0044   ..... R-TO-RP SUBROUTINE .....
R0045   SUBROUTINE TO CONVERT R (VECTOR IN REFERENCE COORD. SYSTEM) TO RP
R0046    (VECTOR IN PLANETARY COORD SYSTEM) EITHER EARTH-FIXED OR MOON-FIXED

R0047    RP=M(T)*(R-LXR)

R0048   CALLING SEQUENCE
R0049    L       CALL
R0050    L+1             R-TO-RP

R0051   SUBROUTINES USED
R0052    EARTHMX,MOONMX,EARTHL

R0053   INPUT
R0054    MPAC= 0 FOR EARTH,NON-ZERO FOR MOON
R0055    0-5D= R VECTOR
R0056    6-7D= TIME

R0057       ITEMS AVAILABLE FROM LAUNCH DATA
R0058        S04LM= THE LIBRATION VECTOR L OF THE MOON AT TIME TIMSUBL,EXPRESSED
R0059        IN THE MOON-FIXED COORD. SYSTEM   RADIANS B0
R0060          ITEMS NECESSARY FOR SUBROUTINES USED (SEE DESCRIPTION OF SUBR.)

R0061   OUTPUT
R0062    MPAC=RP VECTOR METERS B-29 FOR EARTH, B-27 FOR MOON

0063                        26,3366  46020 1  R-TO-RP  STQ     BHIZ
0064    REF  2  LAST 1210   26,3367  00050 1           RPREXIT
0065    REF  1              26,3370  55410 1           RTORPA
0066                        26,3371  77624 1           CALL
0067    REF  2  LAST 1210   26,3372  55416 1           MOONMX
0068                        26,3373  61375 1           VLOAD   VXM
0069    REF  2  LAST 1210   26,3374  02012 0           S04LM           LP=LM
0070    REF  3  LAST 1210   26,3375  00025 0           MMATRIX
0071                        26,3376  77772 0           VSL1            L=MT(T)*LP  RADIANS B0
0072                        26,3377  51235 1  RTORPB   VXV     BVSU
0073    REF  3  LAST 1210   26,3400  00001 0           S04RPR
0074    REF  4  LAST 1212   26,3401  00001 0           S04RPR
0075                        26,3402  77721 0           MXV             M(T)*(R-LXR) B-2
0076    REF  4  LAST 1212   26,3403  00025 0           MMATRIX
0077                        26,3404  40372 0  RPRPXXXX VSL1    SETPD
0078                        26,3405  00001 0           0D
0079                        26,3406  77650 1           GOTO
0080    REF  3  LAST 1212   26,3407  00050 1           RPREXIT
0081                        26,3410  77624 1  RTORPA   CALL            EARTH COMPUTATIONS
0082    REF  2  LAST 1210   26,3411  55570 0           EARTHMX
0083                        26,3412  77624 1           CALL
0084    REF  2  LAST 1210   26,3413  55622 1           EARTHL
0085                        26,3414  77650 1           GOTO            MPAC=L=(-AX,-AY,0) RAD B-0
0086    REF  1              26,3415  55377 1           RTORPB
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R0087   ..... MOONMX SUBROUTINE .....
R0088   SUBROUTINE TO COMPUTE THE TRANSFORMATION MATRIX M FOR THE MOON

R0089   CALLING SEQUENCE
R0090    L       CALL
R0091    L+1             MOONMX

R0092   SUBROUTINES USED
R0093    NEWANGLE

R0094   INPUT
R0095    6-7D= TIME
R0096      ITEMS AVAILABLE FROM LAUNCH DATA
R0097       BSUBC,BDOT
R0098       IINSUBC,NODIO,NODDOT,FSUBC,FDOT
R0099       COSI= COS(I) B-1
R0100       SINI= SIN(I) B-1
R0101         I  IS THE ANGLE BETWEEN THE MEAN LUNAR EQUATORIAL PLANE AND THE
R0102          PLANE OF THE ECLIPTIC  (1 DEGREE  32.1 MINUTES)

R0103   OUTPUT
R0104    MMATRIX= 3X3 M MATRIX B-1   (STORED IN VAC AREA)

 0105                       26,3416   40220 C  MOONMX   STQ    SETPD
 0106   REF   1             26,3417   00051 C           EARTHMXX
 0107                       26,3420   00011 1           8D
 0108                       26,3421   77770 1  AXT,1             B REQUIRES SL 0, SL 5 IN NEWANGLE
 0109                       26,3422   00005 1           5
 0110                       26,3423   65345 C  DLOAD    PDDL     PD 10D              8-9D=BSUBO
 0111   REF   1             26,3424   15652 1           BSUBC                        10-11D= BDOT
 0112   REF   1             26,3425   15644 0           BDOT
 0113                       26,3426   45006 C  PUSH     CALL     PD 12D
 0114   REF   1             26,3427   55543 C           NEWANGLE EXIT WITH PD 8D AND MPAC= B  REVS BO
 0115                       26,3430   71406 C  PUSH     COS      PD 10D
 0116   REF   1             26,3431   14041 1  STODL    COB      PD 8D     COS(B) B-1
 0117                       26,3432   77756 C  SIN                         SIN(B) B-1
 0118   REF   1             26,3433   14043 C  STODL    SOB                  SETUP INPUT FOR NEWANGLE
 0119   REF   1             26,3434   15650 0           FSUBC                        8-9D=FSUBO
 0120                       26,3435   41525 0  PDDL     PUSH     PD 10D THEN 12D     10-11D=FDOT
 0121   REF   1             26,3436   15642 0           FDOT
 0122                       26,3437   45170 C  AXT,1    CALL     F REQUIRES SL 1, SL 6 IN NEWANGLE
 0123                       26,3440   00004 0           4
 0124   REF   2  LAST 1213 26,3441   55543 C           NEWANGLE EXIT WITH PD 8D AND MPAC= F REVS BO
 0125   REF   1             26,3442   14027 1  STODL    AVECTR +2 SAVE F TEMP
 0126   REF   1             26,3443   15646 1           NODIC                        8-9D=NODIO
 0127                       26,3444   41525 0  PDDL     PUSH     PD 10D THEN 12D     10-11D=NODDOT
 0128   REF   1             26,3445   15640 1           NODDOT                       MPAC=T
 0129                       26,3446   45170 C  AXT,1    CALL     NODE REQUIRES SL 0, SL 5 IN NEWANGLE
 0130                       26,3447   00005 1           5
 0131   REF   3  LAST 1213 26,3450   55543 C           NEWANGLE EXIT WITH PD 8D AND MPAC= NODI REVS BO
```

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0132                                26,3451  71406 0    PUSH   COS          PD 10D   8-9D= NODI  REVS  8D
0133                                26,3452  77606 1    PUSH                PD 12D 10-11D= COS(NODI)  8-1
0134  REF   2  LAST 1213           26,3453  00025 0    STORE  AVECTR
0135                                26,3454  76405 1    DMP    SL1R
0136  REF   2  LAST 1213           26,3455  00041 1           COB                                  COS(NODI)    8-1
0137  REF   1                     26,3456  14035 1    STODL  BVECTR +2    PD 10D   20-25D=AVECTR= COB*SIN(NODI)
0138                                26,3457  76405 1    DMP    SL1R                                SOB*SIN(NODI)
0139  REF   2  LAST 1213           26,3460  00043 0           SOB
0140  REF   2  LAST 1214           26,3461  14037 0    STODL  BVECTR +4    PD 8D
0141                                26,3462  41556 1    SIN    PUSH         PD 10D                      -SIN(NODI)   8-1
0142                                26,3463  77676 0    DCOMP                          26-31D=BVECTR= COB*COS(NODI)
0143  REF   3  LAST 1214           26,3464  14033 1    STODL  BVECTR       PD 8D                       SOB*COS(NODI)
0144  REF   3  LAST 1214           26,3465  00027 1           AVECTR +2    MOVE F FROM TEMP LOC. TO 504F
0145  REF   1                     26,3466  14007 0    STODL  504F
0146                                26,3467  76405 1    DMP    SL1R
0147  REF   3  LAST 1214           26,3470  00041 1           COB
0148  REF   4  LAST 1214           26,3471  14027 1    STODL  AVECTR +2
0149  REF   1                     26,3472  00011 1           SINNCDI      8-9D=SIN(NODI)  8-1
0150                                26,3473  76405 1    DMP    SL1R
0151  REF   3  LAST 1214           26,3474  00043 0           SOB
0152  REF   5  LAST 1214           26,3475  14031 0    STODL  AVECTR +4                                 0
0153  REF  26  LAST  89C           26,3476  15332 1           HI6ZEROS                  8-13D= CVECTR= -SOB  8-1
0154                                26,3477  57525 1    PDDL   DCOMP        PD 10D                      COB
0155  REF   4  LAST 1214           26,3500  00043 0           SOB
0156                                26,3501  63325 0    PDDL   PDVL         PD 12D THEN PD 14D
0157  REF   4  LAST 1214           26,3502  00041 1           COB
0158  REF   4  LAST 1214           26,3503  00033 1           BVECTR
0159                                26,3504  63361 0    VXSC   PDVL         PD 20D              BVECTR*SINI  8-2
0160  REF   1                     26,3505  15636 0           SINI
0161  REF   1                     26,3506  00011 1           CVECTR
0162                                26,3507  53361 0    VXSC   VAD          PD 14D              CVECTR*COSI  8-2
0163  REF   1                     26,3510  15634 1           COSI
0164                                26,3511  77772 0    VSL1
0165  REF   5  LAST 1212           26,3512  24041 1    STOVL  MMATRIX +12D PD 8D  M2=BVECTR*SINI+CVECTR*COSI  8-1
0166                                26,3513  63361 0    VXSC   PDVL         PD 14D
0167  REF   2  LAST 1214           26,3514  15636 0           SINI                                 CVECTR*SINI  8-2
0168  REF   5  LAST 1214           26,3515  00033 1           BVECTR
0169                                26,3516  52361 1    VXSC   VSU          PD 8D               BVECTR*COSI  8-2
0170  REF   2  LAST 1214           26,3517  15634 1           COSI
0171                                26,3520  65372 1    VSL1   PDDL         PD 14D
0172  REF   2  LAST 1214           26,3521  00007 0           504F         8-13D=DVECTR=BVECTR*COSI-CVECTR*SINI 8-1
0173                                26,3522  74346 0    COS    VXSC
0174  REF   1                     26,3523  00011 1           DVECTR
0175                                26,3524  73525 1    PDDL   SIN          PD 20D  14-19D= DVECTR*COSF  8-2
0176  REF   3  LAST 1214           26,3525  00007 0           504F
0177                                26,3526  52361 1    VXSC   VSU          PD 14D               AVECTR*SINF  8-2
0178  REF   6  LAST 1214           26,3527  00025 0           AVECTR
0179                                26,3530  77772 0    VSL1
0180  REF   6  LAST 1214           26,3531  14033 1    STODL  MMATRIX +6   M1= AVECTR*SINF-DVECTR*COSF  8-1
0181  REF   4  LAST 1214           26,3532  00007 0           504F
```

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0182                        26,3533  74356 1        SIN     VXSC            PD 8D
0183                        26,3534  71525 0        PDDL    COS             PD 14D  8-13D=DVECTR*SINF B-2
0184  REF   5  LAST 1214    26,3535  00007 0                504F
0185                        26,3536  53361 0        VXSC    VAD             PD 8D          AVECTR*COSF B-2
0186  REF   7  LAST 1214    26,3537  00025 0                AVECTR
0187                        26,3540  57572 0        VSL1    VCOMP
0188  REF   7  LAST 1214    26,3541  34025 1        STCALL  MMATRIX         MO= -(AVECTR*COSF+DVECTR*SINF)  B-1
0189  REF   2  LAST 1213    26,3542  00051 0                EARTHMXX
R0190 COMPLTE X=XO+(XDOT)(T+TO)
R0191 8-9D= XO (REVS B-0),PUSHLOC SET AT 12D
R0192 10-11D=XDOT (REVS/CSEC) SCALED B+23 FOR WEARTH,B+28 FOR NODDOT AND BDOT
R0193                       AND B+27 FOR FDOT
R0194  X1=DIFFERENCE IN 23 AND SCALING OF XDOT,=0 FOR WEARTH,5 FOR NODDOT AND
R0195                                  BDOT AND 4 FOR FDOT
R0196 6-7D=T (CSEC B-28), TIMSUBC= (CSEC B-42 TRIPLE PREC.)

0197                        26,3543  54345 1  NEWANGLE DLOAD  SR              ENTER PD 12D
0198                        26,3544  00007 0                6D
0199                        26,3545  20617 0                14D
0200                        26,3546  72371 1        TAD     TLOAD           CHANGE MODE TO TP
0201  REF   1               26,3547  01707 0                TIMSUBC
0202  REF 649  LAST 1180    26,3550  00155 0                MPAC
0203  REF   1               26,3551  14017 1        STODL   TIMSUBM         T+TO CSEC B-42
0204  REF   2  LAST 1215    26,3552  00020 0                TIMSUBM +1
0205                        26,3553  77605 1        DMP                     PD 10D  MULT BY XDOT IN 10-11D
0206                        26,3554  43257 0        SL*     DAD             PD 8D   ADD XO IN 8-9D AFTER SHIFTING
0207                        26,3555  20206 1                5,1                     SUCH THAT SCALING IS B-0
0208                        26,3556  67206 1        PUSH    SLOAD           PD 10D SAVE PARTIAL (XO+XDOT*T) IN 8-9D
0209  REF   3  LAST 1215    26,3557  00017 1                TIMSUBM
0210                        26,3560  41261 1        SL      DMP
0211                        26,3561  20212 1                9D
0212                        26,3562  00013 0                10D             XDOT
0213                        26,3563  43257 0        SL*     DAD             PD 8D   SHIFT SUCH THAT THIS PART OF X
0214                        26,3564  20213 0                10D,1                   IS SCALED REVS/CSEC B-0
02141                       26,3565  77600 1        BOV                     TURN OFF OVERFLOW IF SET BY SHIFT
02142                       26,3566  55567 0                +1              INSTRUCTION BEFORE EXITING
0215                        26,3567  77616 0        RVQ                     MPAC=X= XO+(XDOT)(T+TO)  REVS BO
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R0216   ..... EARTHMX SUBROUTINE .....
R0217   SUBROUTINE TO COMPUTE THE TRANSFORMATION MATRIX M FOR THE EARTH

R0218   CALLING SEQUENCE
R0219    L       CALL
R0220    L+1             EARTHMX

R0221   SUBROUTINES USED
R0222    NEWANGLE

R0223   INPUT
R0224     INPUT AVAILABLE FROM LAUNCH DATA     AZO  REVS B-0
R0225                                          TEPHEM  CSEC B-42
R0226    6-7D= TIME CSEC B-28

R0227   OUTPUT
R0228    MMATRIX= 3X3 M MATRIX B-1   (STORED IN VAC AREA)

 0229                        26,3570  40220 0  EARTHMX  STQ     SETPD          SET   8-9D=AZO
 0230  REF   3  LAST 1215   26,3571  00051 0                   EARTHMXX
 0231                        26,3572  00011 1                   8D             10-11D=WEARTH
 0232                        26,3573  77770 1                AXT,1             FOR SL 5, AND SL 10  IN NEWANGLE
 0233                        26,3574  00000 1                   0
 0234                        26,3575  65345 0                DLOAD  PDDL            LEAVING PD SET AT 12D FOR NEWANGLE
 0235  REF   1              26,3576  01712 1                   AZO
 0236  REF   1              26,3577  15654 1                   WEARTH
 0237                        26,3600  45006 0           PUSH    CALL
 0238  REF   4  LAST 1213   26,3601  55543 0                   NEWANGLE
 0239                        26,3602  41401 1           SETPD   PUSH           18-19D=504AZ
 0240                        26,3603  00023 0                   18D                          COS(AZ) SIN(AZ) 0
 0241                        26,3604  65346 0           COS     PDDL           20-37D=  MMATRIX= -SIN(AZ) COS(AZ) 0 B-1
 0242  REF   1              26,3605  00023 0                   504AZ                         0       0       1
 0243                        26,3606  65356 1           SIN     PDDL
 0244  REF  27  LAST 1214   26,3607  15332 1                   HI6ZEROS
 0245                        26,3610  73525 1           PDDL    SIN
 0246  REF   2  LAST 1216   26,3611  00023 0                   504AZ
 0247                        26,3612  65276 1           DCOMP   PDDL
 0248  REF   3  LAST 1216   26,3613  00023 0                   504AZ
 0249                        26,3614  63346 0           COS     PDVL
 0250  REF  28  LAST 1216   26,3615  15332 1                   HI6ZEROS
 0251                        26,3616  41525 0           PDDL    PUSH
 0252  REF  11  LAST  832   26,3617  15330 0                   HIDPHALF
 0253                        26,3620  77650 1           GOTO
 0254  REF   4  LAST 1216   26,3621  00051 0                   EARTHMXX
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R0255   ..... EARTHL SUBROUTINE .....
R0256   SUBROUTINE TO COMPUTE L VECTOR FOR EARTH

R0257   CALLING SEQUENCE
R0258    L       CALL
R0259    L+1             EARTHL

R0260   INPUT
R0261    AXC,AYC SET AT LAUNCH TIME WITH AYC IMMEDIATELY FOLLOWING AXC IN CORE

R0262   OUTPUT
R0263             -AX
R0264     MPAC=   -AY    RADIANS B-0
R0265              0

 0266                          26,3622   57545 1  EARTHL   DLOAD   DCOMP
 0267   REF   2  LAST  616    26,3623   01716 0           AXO
 0268   REF   1                26,3624   14017 1           STODL   504LPL
 0269   REF   2  LAST  616    26,3625   01714 1           -AYO
 0270   REF   2  LAST 1217    26,3626   14021 1           STODL   504LPL +2
 0271   REF  29  LAST 1216    26,3627   15332 1           HI6ZEROS
 0272   REF   3  LAST 1217    26,3630   24023 0           STOVL   504LPL +4
 0273   REF   4  LAST 1217    26,3631   00017 1           504LPL
 0274                          26,3632   77616 0           RVQ
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P0275   CONSTANTS AND ERASABLE ASSIGNMENTS
 0276   REF   5  LAST 1207   04,3450            181      =      DP1/2            1  SCALED B-1
 0277                        26,3633   17775 1  COSI     2DEC   .99964115 B-1    COS(1 DEG 32.1 MIN) B-1
 0277                        26,3634   01734 0
 0278                        26,3635   00333 1  SINI     2DEC   .02678760 B-1    SIN(1 DEG 32.1 MIN) B-1
 0278                        26,3636   16153 1
 0279   REF  38  LAST 116C     0050            RPREXIT  =      S1               R-TO-RP AND RP-TO-R SUBR EXIT
 0280   REF  13  LAST 1209     0051            EARTHMXX =      S2               EARTHMX,MOONMX SUBR. EXITS
 0281                          0000            504RPR   =      0D               6 REGS  R OR RP VECTOR
 0282                          0010            SINNODI  =      8D               2       SIN(NODI)
 0283                          0010            DVECTR   =      8D               6       D VECTOR MOON
 0284                          0010            CVECTR   =      8D               6       C VECTR MOON
 0285                          0022            504AZ    =      18D              2       AZ
 0286                          0016            TIMSUBM  =      14D              3       TIME SUB M (MOON) T+TO IN GETAZ
 0287                          0016            504LPL   =      14D              6       L OR LP VECTOR
 0288                          0024            AVECTR   =      20D              6       A VECTOR (MOON)
 0289                          0032            BVECTR   =      26D              6       B VECTOR (MOON)
 0290                          0024            MMATRIX  =      20D              18      M MATRIX
 0291                          0040            COB      =      32D              2       COS(B) B-1
 0292                          0042            SOB      =      34D              2       SIN(B) B-1
 0293                          0006            504F     =      6D               2       F (MOON)
 0297                        26,3637   77665 1  NODDOT   2DEC   -.457335143 E-2  REVS/CSEC B+28=-1.07047016 E-8  RAD/SEC
 0297                        26,3640   42175 1
 0298                        26,3641   22211 0  FDOT     2DEC   .570862491       REVS/CSEC B+27= 2.67240019 E-6  RAD/SEC
 0298                        26,3642   00265 0
 0299                        26,3643   77777 0  BDOT     2DEC   -3.07500412 E-8  REVS/CSEC B+28=-7.19756666 E-14 RAD/SEC
 0299                        26,3644   77767 1
 0300                        26,3645   41215 1  NOD1C    2DEC   -.960101269      REVS B-0     = -6.03249419  RAD
 0300                        26,3646   66331 0
 0301                        26,3647   15237 0  FSUBO    2DEC   .415958375       REVS B-0     =  2.61379488  RAD
 0301                        26,3650   26751 0
 0302                        26,3651   02052 1  BSUBO    2DEC   .0651205006      REVS B-0     =  0.409164173 RAD
 0302                        26,3652   35713 1
 0303                        26,3653   37116 0  WEARTH   2DEC   .973561855       REVS/CSEC B+23=7.29211515 E-5 RAD/SEC
 0303                        26,3654   32630 0
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R0001    INCORP1--PERFORMS THE SIX DIMENSIONAL STATE VECTOR DEVIATION FOR POSITI
R0002  ON AND VELOCITY OR THE NINE DIMENSIONAL DEVIATION OF POSITION,VELOCITY,A
R0003  ND RADAR OR LANDMARK BIAS.THE OUTPUT OF THE BVECTOR ROUTINE ALONG WITH T
R0004  HE ERROR TRANSITION MATRIX(W) ARE USED AS INPUT TO THE ROUTINE.THE DEVIA
R0005  TION IS OBTAINED BY COMPUTING AN ESTIMATED TRACKING MEASUREMENT FROM THE
R0006  CURRENT STATE VECTOR AND COMPARING IT WITH AN ACTUAL TRACKING MEASUREMEN
R0007  T AND APPLYING A STATISTICAL WEIGHTING VECTOR.
R0008  INPUT
R0009     DMENFLG = 0 6DIMENSIONAL BVECTOR  1= 9DIMENSIONAL
R0010           W = ERROR TRANSITION MATRIX 6X6 OR 9X9
R0011    VARIANCE = VARIANCE (SCALAR)
R0012      DELTAG = MEASURED DEVIATION(SCALAR)
R0013     BVECTOR = 6 OR 9 DIMENSIONAL BVECTOR

R0014  OUTPUT
R0015       DELTAX = STATE VECTOR DEVIATIONS 6 OR 9 DIMENSIONAL
R0016           ZI = VECTOR USED FOR THE INCORPORATION 6 OR 9 DIMENSIONAL
R0017     GAMMA = SCALAR
R0018     OMEGA = OMEGA WEIGHTING VECTOR 6 OR 9 DIMENTIONAL
R0019  CALLING SEQUENCE
R0020     L  CALL INCORP1

R0021  NORMAL EXIT

R0022     L+1 OF CALLING SEQUENCE

0023                          37,3700                    BANK   37
0024  REF   1                 36,2000                    SETLOC MEASINC
0025                          36,3250                    BANK

0026  REF   1                                            COUNT* $$/INCOR

0027  REF  57 LAST  622       E5,1400                    EBANK= W

0028                          36,3250   77620 C  INCORP1 STQ
0029  REF  10 LAST  574       36,3251   02317 C          EGRESS
0030                          36,3252   66370 C          AXT,1  SSP
0031                          36,3253   00066 1                 54D
0032  REF  39 LAST 1218       36,3254   00051 C                 S1
0033                          36,3255   00022 1                 18D              IX1 = 54  S1= 18
0034                          36,3256   66374 1          AXT,2  SSP
0035                          36,3257   00022 1                 18D
0036  REF  14 LAST 1218       36,3260   00052 C                 S2
0037                          36,3261   00006 1                 6                IX2 = 18  S2=6
0038                          36,3262   63775 1  Z123    VLOAD  MXV*
0039  REF  20 LAST  614       36,3263   03502 C                 BVECTOR          BVECTOR (0)
0040  REF  58 LAST 1219       36,3264   02467 C                 W +54D,1
0041  REF   2 LAST   94       36,3265   12745 1          STORE  ZI +18D,2
0042                          36,3266   77775 1          VLOAD
0043  REF  21 LAST 1219       36,3267   03510 C                 BVECTOR +6       BVECTOR (1)
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0044                          36,3270  52717 1          MXV*   VAD*
0045  REF  59  LAST 1219      36,3271  02555 0                 W +108D,1
0046  REF   3  LAST 1219      36,3272  75032 1                 ZI +18D,2
0047  REF   4  LAST 122C      36,3273  12745 1          STORE  ZI +18D,2
0048                          36,3274  77775 1          VLOAD
0049  REF  22  LAST 1219      36,3275  03516 0                 BVECTOR +12D     BVECTOR (2)
0050                          36,3276  52717 1          MXV*   VAD*
0051  REF  60  LAST 122C      36,3277  02643 1                 W +162D,1
0052  REF   5  LAST 122C      36,3300  75032 1                 ZI +18D,2        B(0)*W+B(1)*(W+54)+B(2)*(W+108)FIRST PAS
0053  REF   6  LAST 122C      36,3301  12745 1          STORE  ZI +16D,2        ZI THEN Z2 THEN Z3
0054                          36,3302  77700 0          TIX,1
0055  REF   1                 36,3303  75304 1                 INCOR1
0056                          36,3304  43104 0  INCOR1  TIX,2  BON
0057  REF   1                 36,3305  75262 0                 Z123             LOOP FOR Z1,Z2,Z3
0058  REF   8  LAST  615      36,3306  02706 1                 DMENFLG
0059  REF   1                 36,3307  75313 1                 INCOR1A
0060                          36,3310  77775 1          VLOAD
0061  REF  20  LAST  622      36,3311  15332 1                 ZEROVECS
0062  REF   7  LAST 122C      36,3312  02737 0          STORE  ZI +12D
0063                          36,3313  77201 1  INCOR1A SETPD  VLOAD
0064                          36,3314  00001 0                 0
0065  REF   8  LAST 122C      36,3315  02723 0                 ZI
0066                          36,3316  47036 1          VSQ    RTB
0067  REF   6  LAST  870      36,3317  45562 1                 TPMODE
0068                          36,3320  47515 0          PDVL   VSQ
0069  REF   9  LAST 122C      36,3321  02731 0                 ZI +6
0070                          36,3322  76234 0          RTB    TAD
0071  REF   7  LAST 122C      36,3323  45562 1                 TPMODE
0072                          36,3324  47515 0          PDVL   VSQ
0073  REF  10  LAST 122C      36,3325  02737 0                 ZI +12D
0074                          36,3326  76234 0          RTB    TAD
0075  REF   8  LAST 122C      36,3327  45562 1                 TPMODE
0076                          36,3330  77171 0          TAD    AXT,2
0077  REF  12  LAST  615      36,3331  03526 0                 VARIANCE
0078                          36,3332  00000 1                 0
0079  REF   1                 36,3333  01257 0          STORE  TRIPA            ZI*2 + Z2*2 + Z3*2 + VARIANCE
0080                          36,3334  40151 0          TLOAD  BOV
0081  REF  13  LAST 122C      36,3335  03526 0                 VARIANCE         CLEAR OVFIND
0082                          36,3336  75337 1                 +1
0083  REF   1                 36,3337  01262 0          STORE  TEMPVAR          TEMP STORAGE FOR VARIANCE
0084                          36,3340  77654 0          BZE
0085  REF   1                 36,3341  75350 0                 INCOR1C
0086                          36,3342  40112 1  INCOR1B SL2    BOV
0087  REF   2  LAST 122C      36,3343  75350 0                 INCOR1C
0088  REF   2  LAST 122C      36,3344  01262 0          STORE  TEMPVAR
0089                          36,3345  52114 1          INCR,2 GOTO
0090                          36,3346  00001 0          DEC    1
0091  REF   1                 36,3347  75342 0                 INCOR1B
0092                          36,3350  61551 1  INCOR1C TLOAD  ROUND
0093  REF   2  LAST 122C      36,3351  01257 0                 TRIPA
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0094                          36,3352  75405 1        DMP     SQRT
0095  REF   3  LAST 1220      36,3353  01262 0                TEMPVAR
0096                          36,3354  76257 0        SL*     TAD
0097                          36,3355  57576 1                0,2
0098  REF   3  LAST 1220      36,3356  01257 0                TRIPA
0099                          36,3357  63101 1        NORM    INCR,2
0100  REF  27  LAST 1088      36,3360  00050 1                X2
0101                          36,3361  77775 1        DEC     -2
0102                          36,3362  77134 1        SXA,2   AXT,2
0103  REF   2  LAST   86      36,3363  02215 0                NORMGAM        NORMALIZATION COUNT -2 FOR GAMMA
0104                          36,3364  00242 0                162D
0105                          36,3365  40265 1        BDDV    SETPD
0106  REF   4  LAST  564      36,3366  15322 0                DP1/4TH
0107                          36,3367  00001 0                0
0108  REF   2  LAST  118      36,3370  03456 0        STORE   GAMMA
0109                          36,3371  60351 0        TLOAD   NORM
0110  REF   4  LAST 1221      36,3372  01257 0                TRIPA
0111  REF  56  LAST 1160      36,3373  00047 1                X1
0112                          36,3374  65345 0        DLOAD   PDDL           PD 0-1 = NORM (A)
0113  REF 650  LAST 1215      36,3375  00155 0                MPAC
0114  REF   5  LAST  615      36,3376  03524 1                DELTAQ
0115                          36,3377  77701 1        NORM
0116  REF  40  LAST 1219      36,3400  00051 0                S1
0117                          36,3401  70460 1        XSU,1   SR1
0118  REF  41  LAST 1221      36,3402  00050 1                S1
0119                          36,3403  41471 0        DDV     PUSH           PD 0-1 = DELTAQ/A
0120                          36,3404  77731 1        SSP
0121  REF  15  LAST 1215      36,3405  00052 0                S2
0122                          36,3406  00066 1                54D
0123                          36,3407  60775 1  INCOR2 VLOAD   VXM*           COMPUTE OMEGA1,2,3
0124  REF  11  LAST 1220      36,3410  02723 0                ZI
0125  REF  61  LAST 1220      36,3411  75134 0                W +162D,2
0126                          36,3412  77206 0        PUSH    VLOAD
0127  REF  12  LAST 1221      36,3413  02731 0                ZI +6
0128                          36,3414  53303 1        VXM*    VAD
0129  REF  62  LAST 1221      36,3415  75112 1                W +180D,2
0130                          36,3416  77206 0        PUSH    VLOAD
0131  REF  13  LAST 1221      36,3417  02737 0                ZI +12D
0132                          36,3420  53303 1        VXM*    VAD
0133  REF  63  LAST 1221      36,3421  75070 1                W +198D,2
0134                          36,3422  61006 0        PUSH    TIX,2          PD 2-7=OMEGA1,8-13=OMEGA2,14-19=OMEGA3
0135  REF   1                 36,3423  75407 0                INCOR2
0136                          36,3424  45575 1        VLOAD   STADR
0137  REF   2  LAST  118      36,3425  74303 1        STORE   OMEGA +12D
0138                          36,3426  45575 1        VLOAD   STADR
0139  REF   3  LAST 1221      36,3427  74311 1        STORE   OMEGA +6
0140                          36,3430  45575 1        VLOAD   STADR
0141  REF   4  LAST 1221      36,3431  74317 1        STORE   OMEGA
0142                          36,3432  77214 0        BON     VLOAD
0143  REF   9  LAST 1220      36,3433  02706 1                OMENFLG
```

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0144   REF   1                  36,3434  75437 C                    INCOR2AB
0145   REF  21  LAST 122C       36,3435  15332 1                    ZEROVECS
0146   REF   5  LAST 1221       36,3436  03474 C            STORE   OMEGA +12D
0147                             36,3437  66374 1  INCOR2AB  AXT,2  SSP
0148                             36,3440  00022 1                    18D
0149   REF  16  LAST 1221       36,3441  00052 C                    S2
0150                             36,3442  00006 1                    6
0151                             36,3443  77773 1  INCOR3    VLOAD*
0152   REF   6  LAST 1222       36,3444  74275 1                    OMEGA +18D,2
0153                             36,3445  53761 1            VXSC    VSL*
0154                             36,3446  00001 C                    0                  DELTAQ/A
0155                             36,3447  20201 C                    0,1
0156   REF  12  LAST  615       36,3450  11301 C            STORE   DELTAX +18D,2
0157                             36,3451  77304 C            TIX,2   VLOAD
0158   REF   1                  36,3452  75443 C                    INCOR3
0159   REF  13  LAST 1222       36,3453  01265 1                    DELTAX +6
0160                             36,3454  77732 1            VSL3
0161   REF  14  LAST 1222       36,3455  01265 1            STORE   DELTAX +6
0162                             36,3456  77650 1            GOTO
0163   REF  11  LAST 1219       36,3457  02317 C                    EGRESS
```

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R0164    INCORP2 -INCORPORATES THE COMPUTED STATE VECTOR DEVIATIONS INTO THE
R0165   ESTIMATED STATE VECTOR. THE STATE VECTOR UPDATED MAY BE FOR EITHER THE
R0166   LEM OR THE CSM.DETERMINED BY FLAG VEHUPFLG.(ZERO = LEM) (1 = CSM)
R0167   INPUT
R0168      PERMANENT STATE VECTOR FOR EITHER THE LEM OR CSM
R0169      VEHUPFLG = UPDATE VEHICLE 0=LEM  1=CSM
R0170      W =          ERROR TRANSITION MATRIX
R0171      DELTAX   =   COMPUTED STATE VECTOR DEVIATIONS
R0172      DMENFLG  =   SIZE OF W MATRIX (ZERO =6X6) (1=9X9)
R0173      GAMMA    =   SCALAR FOR INCORPORATION
R0174      ZI       =   VECTOR USED IN INCORPORATION
R0175      OMEGA    =   WEIGHTING VECTOR

R0176   OUTPUT
R0177      UPDATED PERMANENT STATE VECTOR

R0178   CALLING SEQUENCE
R0179      L  CALL INCORP2

R0180   NORMAL EXIT
R0181      L+1 OF CALLING SEQUENCE

 0182   REF    1                  36,2000                    SETLOC MEASINC1
 0183                             36,3460                    BANK
 0184   REF    2 LAST 1219 TO 1223:   136   136*             COUNT* $$/INCOR

 0185                             36,3460   45020 1  INCORP2  STQ     CALL
 0186   REF   12  LAST 1222      36,3461   02317 0            EGRESS
 0187   REF   21  LAST  865      36,3462   27371 1            INTSTALL
 0188                             36,3463   74375 0            VLOAD   VXSC              CALC. GAMMA * OMEGA1,2,3
 0189   REF    7  LAST 1222      36,3464   03460 0            OMEGA
 0190   REF    3  LAST 1221      36,3465   03456 0            GAMMA
 0191   REF    2  LAST   94      36,3466   26643 1            STOVL   OMEGAM1
 0192   REF    8  LAST 1223      36,3467   03466 0            OMEGA +6
 0193                             36,3470   77761 1            VXSC
 0194   REF    4  LAST 1223      36,3471   03456 0            GAMMA
 0195   REF    2  LAST   94      36,3472   26651 1            STOVL   OMEGAM2
 0196   REF    9  LAST 1223      36,3473   03474 0            OMEGA +12D
 0197                             36,3474   77761 1            VXSC
 0198   REF    5  LAST 1223      36,3475   03456 0            GAMMA
 0199   REF    2  LAST   94      36,3476   02657 1            STORE   OMEGAM3
 0200                             36,3477   77776 1            EXIT
 0201   REF    1                  36,3500   3 3761 1           CAF     54DD            INITIAL IX 1 SETTING FOR W MATRIX
 0202   REF    2  LAST    77      36,3501   55'252 1           TS      WIXA
 0203   REF    2  LAST    77      36,3502   55'253 0           TS      WIXB
 0204   REF  245  LAST 1198      36,3503   3 4714 1           CAF     ZERO
 0205   REF    2  LAST    77      36,3504   55'254 1           TS      ZIXA            INITIAL IX 2 SETTING FOR Z COMPONENT
 0206   REF    2  LAST    77      36,3505   55'255 0           TS      ZIXB
 0207   REF   92  LAST 1048      36,3506   0 5301 0  FAZA     TC      PHASCHNG
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0208                                36,3507   04022 C          OCT     04022
0209   REF  48  LAST  78C           36,3510   0 5435 C         TC      UPFLAG
0210   REF   2  LAST  501           36,3511   00236 C          ADRES   REINTFLG
0212   REF   3  LAST 1223           36,3512   3 1253 1  FAZA1  CA      WIXB      START FIRST PHASE OF INCORP2
0213   REF   3  LAST 1223           36,3513   55*252 1         TS      WIXA       TO UPDATE 6 OR 9 DIM. W MATRIX IN TEMP
0214   REF   3  LAST 1223           36,3514   3 1255 1         CA      ZIXB
0215   REF   3  LAST 1223           36,3515   55*254 1         TS      ZIXA
0216   REF 229  LAST 1095           36,3516   0 6006 1         TC      INTPRET
0217                                36,3517   73150 1          LXA,1   LXA,2
0218   REF   4  LAST 1224           36,3520   01252 C                  WIXA
0219   REF   4  LAST 1224           36,3521   01254 C                  ZIXA
0220                                36,3522   70731 C          SSP     DLOAD*
0221   REF  42  LAST 1221           36,3523   00051 C                  S1
0222                                36,3524   00006 1                  6
0223   REF  14  LAST 1221           36,3525   75054 1                  ZI,2
0224                                36,3526   60276 1          DCOMP   NORM      CALC UPPER 3X9 PARTITION OF W MATRIX
0225   REF  17  LAST 1222           36,3527   00052 C                  S2
0226                                36,3530   65161 1          VXSC    XCHX,2
0227   REF   3  LAST 1223           36,3531   02643 1                  OMEGAM1
0228   REF  18  LAST 1224           36,3532   00051 C                  S2
0229                                36,3533   57144 1          LXC,2   XAD,2
0230   REF  28  LAST 1221           36,3534   00047 1                  X2
0231   REF   3  LAST 1221           36,3535   02215 C                  NORMGAM
0232                                36,3536   65057 C          VSL*    XCHX,2
0233                                36,3537   57576 1                  0,2
0234   REF  19  LAST 1224           36,3540   00051 C                  S2
0235                                36,3541   77653 1          VAD*
0236   REF  64  LAST 1221           36,3542   02467 C                  W +54D,1
0237   REF   2  LAST   94           36,3543   02665 C          STORE   HOLDW
0238                                36,3544   57543 1          DLOAD*  DCOMP     CALC MIDDLE 3X9 PARTITION OF W MATRIX
0239   REF  15  LAST 1224           36,3545   75054 1                  ZI,2
0240                                36,3546   74301 C          NORM    VXSC
0241   REF  20  LAST 1224           36,3547   00052 C                  S2
0242   REF   3  LAST 1223           36,3550   02651 1                  OMEGAM2
0243                                36,3551   71124 C          XCHX,2  LXC,2
0244   REF  21  LAST 1224           36,3552   00051 C                  S2
0245   REF  29  LAST 1224           36,3553   00047 1                  X2
0246                                36,3554   53674 1          XAD,2   VSL*
0247   REF   4  LAST 1224           36,3555   02215 C                  NORMGAM
0248                                36,3556   57576 1                  0,2
0249                                36,3557   52724 1          XCHX,2  VAD*
0250   REF  22  LAST 1224           36,3560   00051 C                  S2
0251   REF  65  LAST 1224           36,3561   02555 C                  W +108D,1
0252   REF   3  LAST 1224           36,3562   02673 1          STORE   HOLDW +6
0253                                36,3563   77614 1          BOFF
0254   REF  10  LAST 1221           36,3564   02746 0                  DMENFLG   BRANCH IF 6 DIMENSIONAL
0255   REF   1                      36,3565   75605 C                  FAZB
0256                                36,3566   57543 1          DLOAD*  DCOMP     CALC LOWER 3X9 PARTITION OF W MATRIX
0257   REF  16  LAST 1224           36,3567   75054 1                  ZI,2
0258                                36,3570   74301 C          NORM    VXSC
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0259  REF  23  LAST 1224   36,3571  00052 0                  S2
0260  REF   3  LAST 1223   36,3572  02657 1                  OMEGAM3
0261                       36,3573  71124 0        XCHX,2    LXC,2
0262  REF  24  LAST 1225   36,3574  00051 0                  S2
0263  REF  30  LAST 1224   36,3575  00047 1                  X2
0264                       36,3576  53674 1        XAD,2     VSL*
0265  REF   5  LAST 1224   36,3577  02215 0                  NORMGAM
0266                       36,3600  57576 1                  0,2
0267                       36,3601  52724 1        XCHX,2    VAD*
0268  REF  25  LAST 1225   36,3602  00051 0                  S2
0269  REF  66  LAST 1224   36,3603  02643 1                  W +162D,1
0270  REF   4  LAST 1224   36,3604  02701 0        STORE     HOLDW +12D
0271                       36,3605  77624 1  FAZB   CALL
0272  REF  18  LAST  615   36,3606  56712 0                  GRP2PC
0273                       36,3607  77776 1        EXIT
0274  REF   5  LAST 1224   36,3610  3 1252 0  FAZB1  CA       WIXA        START 2ND PHASE OF INCORP2 TO TRANSFER
0275  REF   1              36,3611  6 3762 1                 AD        6DD          TEMP REG TO PERM W MATRIX
0276  REF   4  LAST 1224   36,3612  55'253 0                 TS        WIXB
0277  REF   5  LAST 1224   36,3613  3 1254 0                 CA        ZIXA
0278  REF   2  LAST  185   36,3614  6 7715 0                 AD        MINUS2
0279  REF   4  LAST 1224   36,3615  55'255 0                 TS        ZIXB
0280  REF 230  LAST 1224   36,3616  0 6006 1                 TC        INTPRET
0281                       36,3617   66350 1        LXA,1     SSP
0282  REF   6  LAST 1225   36,3620  01252 0                  WIXA
0283  REF  43  LAST 1224   36,3621  00051 0                  S1
0284                       36,3622  00006 1                  6
0285                       36,3623  77775 1        VLOAD
0286  REF   5  LAST 1225   36,3624  02665 0                  HOLDW
0287  REF  67  LAST 1225   36,3625  06467 1        STORE     W +54D,1
0288                       36,3626  77775 1        VLOAD
0289  REF   6  LAST 1225   36,3627  02673 1                  HOLDW +6
0290  REF  68  LAST 1225   36,3630  06555 1        STORE     W +108D,1
0291                       36,3631  77214 0        BOFF      VLOAD
0292  REF  11  LAST 1224   36,3632  02746 0                  DMENFLG
0293  REF   1              36,3633  75643 1                  FAZB5
0294  REF   7  LAST 1225   36,3634  02701 0                  HOLDW +12D
0295  REF  65  LAST 1225   36,3635  06643 0        STORE     W +162D,1
0296                       36,3636  52100 1  FAZB2  TIX,1    GOTO
0297                       36,3637  75641 0                  +2
0298  REF   1              36,3640  75651 1                  FAZC        DONE WITH W MATRIX. UPDATE STATE VECTOR
0299                       36,3641  77634 0        RTB
0300  REF   1              36,3642  75506 0                  FAZA
0301                       36,3643  43335 0  FAZB5  SLOAD     DAD
0302  REF   5  LAST 1225   36,3644  01256 1                  ZIXB
0303  REF   1              36,3645  35764 1                  12DD
0304                       36,3646  52030 0        BHIZ      GOTO
0305  REF   2  LAST 1225   36,3647  75651 1                  FAZC
0306  REF   1              36,3650  75636 0                  FAZB2
0307                       36,3651  77624 1  FAZC   CALL
0308  REF  19  LAST 1225   36,3652  56712 0                  GRP2PC
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0309                                36,3653  53375 C          VLOAD  VAD              START 3RD PHASE OF INCORP2
0310  REF   8  LAST  598            36,3654  01701 C                 X789             7TH,8TH,9TH,COMPONENT OF STATE VECTOR
0311  REF  15  LAST 1222            36,3655  01273 C                 DELTAX +120      INCORPORATION FOR X789
0312  REF   2  LAST  118            36,3656  03450 C          STORE  TX789
0313                                36,3657  47014 1          BON    RTB
0314  REF  13  LAST  615            36,3660  00707 1                 VEHUPFLG
0315  REF   1                       36,3661  75751 C                 DOCSM
0316  REF   1                       36,3662  26745 C                 MOVEPLEM
0317                                36,3663  77004 0  FAZAB  BOVB    AXT,2
0318  REF   8  LAST  823            36,3664  57314 C                 TCDANZIG
0319                                36,3665  00000 1                 0
0320                                36,3666  77014 1          BOFF   AXT,2
0321  REF   8  LAST  571            36,3667  04343 1                 MOONTHIS
0322                                36,3670  75672 0                 +2
0323                                36,3671  00002 0                 2
0324                                36,3672  53775 1          VLOAD  VSR*
0325  REF  16  LAST 1226            36,3673  01257 C                 DELTAX           B27 IF MOON ORBIT, B29 IF EARTH
0326                                36,3674  57205 1                 0 -7,2
0327                                36,3675  40055 C          VAD    BOV
0328  REF   4  LAST  282            36,3676  01521 C                 TDELTAV
0329  REF   1                       36,3677  75711 1                 FAZAB1
0330  REF   5  LAST 1226            36,3700  25521 C          STOVL  TDELTAV
0331  REF  17  LAST 1226            36,3701  01265 1                 DELTAX +6        B5 IF MOON ORBIT, B7 IF EARTH
0332                                36,3702  53257 1          VSR*   VAD
0333                                36,3703  57202 C                 0 -4,2
0334  REF   4  LAST  283            36,3704  01527 C                 TNUV
0335                                36,3705  77600 1                 BOV
0336  REF   1                       36,3706  75715 C                 FAZAB2
0337  REF   5  LAST 1226            36,3707  35527 1          STCALL TNUV
0338  REF   1                       36,3710  75724 1                 FAZAB3
0339                                36,3711  53375 C  FAZAB1  VLOAD  VAD
0340  REF  12  LAST  865            36,3712  01535 C                 RCV
0341  REF  18  LAST 1226            36,3713  01257 C                 DELTAX
0342  REF  13  LAST 1226            36,3714  01535 C          STORE  RCV
0343                                36,3715  53375 C  FAZAB2  VLOAD  VAD
0344  REF  11  LAST  865            36,3716  01543 1                 VCV
0345  REF  19  LAST 1226            36,3717  01265 1                 DELTAX +6
0346  REF  12  LAST 1226            36,3720  01543 1          STORE  VCV
0347                                36,3721  45134 0          SXA,2  CALL
0348  REF   3  LAST  258            36,3722  02150 1                 PBODY
0349  REF   1                       36,3723  23344 0                 RECTIFY
03491                               36,3724  77624 1  FAZAB3  CALL
03492 REF  20  LAST 1225            36,3725  56712 C                 GRP2PC
0350                                36,3726  47014 1          BON    RTB
0351  REF  14  LAST 1226            36,3727  00707 1                 VEHUPFLG
0352  REF   1                       36,3730  75754 C                 DOCSM1
0353  REF   1                       36,3731  26724 1                 MOVEALEM
0354                                36,3732  77624 1          CALL
0355  REF   2  LAST  258            36,3733  20263 1                 SVDWN2           STORE DOWNLINK STATE VECTOR
0356                                36,3734  77624 1  FAZAB4  CALL
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0357  REF  21  LAST 1226   36,3735   56712 C                  GRP2PC    PHASE CHANGE
0358                       36,3736   77214 C           BOFF   VLOAD
0359  REF  12  LAST 1225   36,3737   02746 C                  DMENFLG
0360  REF   1              36,3740   75743 C                  FAZAB5    6 DIMENSIONAL
0361  REF   3  LAST 1226   36,3741   03450 C                  TX789     9 DIMENSIONAL
0362  REF   9  LAST 1226   36,3742   01701 C           STORE  X789
0363                       36,3743   66150 0  FAZAB5   LXA,1  SXA,1
0364  REF  13  LAST 1223   36,3744   02317 C                  EGRESS
0365  REF  20  LAST 1163   36,3745   00052 C                  QPRET
0366                       36,3746   77776 1           EXIT
0367  REF  60  LAST 1036   36,3747   0 4574 0          TC     POSTJUMP  EXIT
0368  REF   3  LAST  622   36,3750   27406 C           CADR   INTWAKE
0369                       36,3751   52034 1  DOCSM    RTB    GOTO
0370  REF   1              36,3752   26700 1                  MOVEPCSM
0371  REF   1              36,3753   75663 C                  FAZAB
0372                       36,3754   45034 1  DOCSM1   RTB    CALL
0373  REF   2  LAST   32   36,3755   26651 1                  MOVEACSM
0374  REF   2  LAST  258   36,3756   20237 C                  SVDWN1    STORE DOWNLINK STATE VECTOR
0375                       36,3757   77650 1           GOTO
0376  REF   1              36,3760   75734 C                  FAZAB4
0377  REF  22  LAST 1222   26,3331             ZEROO    =      ZEROVECS
0378                       36,3761   00066 1  54DD     DEC    54
0379                       36,3762   77771 0  6DD      DEC    -6
0380                       36,3763   00014 1  12DD     DEC    12
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L CONIC SUBROUTINES

P0001 PROGRAM DESCRIPTION - ENTIRE CONIC SUBROUTINE LOG SECTION
R0003 MOD NO. - 0
R0005 MOD BY KRALSE
R0007

DATE - 1 SEPTEMBER 1967
LOG SECTION - CONIC SUBROUTINES
ASSEMBLY - COLOSSUS REVISION 88

R0008 FUNCTIONAL DESCRIPTION -

R0009 THE FOLLOWING SET OF SUBROUTINES SOLVE VARIOUS PROBLEMS INVOLVING THE TRAJECTORY PRODUCED BY A CENTRAL
R0011 INVERSE-SQUARE FORCE ACTING ON A POINT MASS, AS OUTLINED IN THE CMC AND LGC LUNAR LANDING MISSION GSOP, SECTION
R0013 5.5.1.2. A GENERAL USAGE POINT-OF-VIEW WAS TAKEN IN FORMULATING, MECHANIZING, AND SCALING THE SUBROUTINES,
R0015 RATHER THAN OPTIMIZING EACH FOR A PARTICULAR USE. THEREFORE, MULTIPLE USAGE CAN BE MADE OF THE SUBROUTINES
R0017 INVOLVING ANY REALISTIC SET OF CONSTRAINTS. IT SHOULD BE NOTED THAT ONLY ONE SET OF CODING IS USED, WHETHER THE
R0019 EARTH, MOON, OR ANY OTHER CELESTIAL BODY IS SPECIFIED AS THE CENTRAL BODY OF THE PROBLEM, PROVIDED ONE OBSERVES
R0021 THE INHERENT SCALE CHANGE REQUIRED IN POSITION, VELOCITY, MU, AND TIME, AS OUTLINED IN MISSION PROGRAMMING
R0023 DEFINITION MEMO NO. 10. THIS CAN BE ACCOMPLISHED BY SIMPLY ADDING TO THE MUTABLE AND INITIALIZING THE SUBROU-
R0025 TINES APPROPRIATELY.
R0026 DUE TO THE UNIFORMITY OF THE EQUATIONS INVOLVED, CODING WAS MINIMIZED BY TREATING INDIVIDUAL EQUATIONS AND
R0028 BLOCKS OF EQUATIONS AS SUBROUTINES OF LOWER RANK WHENEVER POSSIBLE. AS A RESULT, THREE BY-PRODUCTS SUBROUTINES,
R0030 DIRECTLY USABLE AS INDEPENDENT SUBROUTINES, WERE GENERATED.

R0031 RESTRICTIONS -

R0032 THE ONLY LIMITATION IN THE SCOPE OF PROBLEM WHICH CAN BE SOLVED BY A PARTICULAR SUBROUTINE IS THE SCALING
R0034 LIMIT OF EACH PARAMETER AS SPECIFIED IN THE GSOP. THESE SCALING LIMITS WERE CHOSEN SO THAT ALL FEASIBLE TRAJEC-
R0036 TORIES COULD BE HANDLED.
R0037 SINCE THE SUBROUTINES (EXCEPT KEPLER) USE COMMON SUBROUTINES OF LOWER RANK WHICH USE ERASABLE OTHER THAN
R0039 THE PUSHLIST (DUE TO ITS LIMITED SIZE) AND COMMON INTERPRETIVE SWITCHES, THE CONIC SUBROUTINES CANNOT BE ALLOWED
R0041 TO INTERRUPT EACH OTHER. IT IS UP TO THE USER TO GUARANTEE THIS CONDITION.
R0043

L CONIC SUBROUTINES USER'S PAGE NO. 2 EO S3

P0044 PROGRAM DESCRIPTION - KEPLER SUBROUTINE DATE - 11 OCTOBER 1967
R0046 MOD NO. -1 LOG SECTION - CONIC SUBROUTINES
R0048 MOD BY KRALSE ASSEMBLY - COLOSSUS 103 AND SUNDANCE 222
R0050

R0051 FUNCTIONAL DESCRIPTION -
R0052 THIS SUBROUTINE, GIVEN AN INITIAL STATE VECTOR AND THE DESIRED TRANSFER TIME THROUGH WHICH THE STATE IS TO
R0054 BE UPDATED ALONG A CONIC TRAJECTORY, COMPUTES THE NEW, UPDATED STATE VECTOR. THE TRAJECTORY MAY BE ANY CONIC
R0056 SECTION - CIRCULAR, ELLIPTIC, PARABOLIC, HYPERBOLIC, OR RECTILINEAR WITH RESPECT TO THE EARTH OR THE MOON. THE
R0058 USE OF THE SUBROUTINE CAN BE EXTENDED USING OTHER PRIMARY BODIES BY SIMPLE ADDITIONS TO THE MUTABLE WITHOUT
R0060 INTRODUCING ANY CODING CHANGES, ACCEPTING THE INHERENT SCALE FACTOR CHANGES IN POSITION AND VELOCITY. AN ITERA-
R0062 TION TECHNIQUE IS UTILIZED IN THE COMPUTATION.
R0063 IF A NEGATIVE TIME-OF-FLIGHT IS INPUT, THE PROGRAM WILL SOLVE FOR THE STATE WHICH WOULD BE PRODUCED BY
R0065 EXTRAPOLATING THE POSITION BACKWARD IN TIME.
R0065.1 IF THE DESIRED TRANSFER TIME IS POSITIVE AND EXCEEDS THE ORBITAL PERIOD, THE SUBROUTINE, THROUGH A MODULAR
R0065.3 TECHNIQUE, WILL COMPUTE THE STATE CORRESPONDING TO THE DESIRED TIME AS USUAL.
R0066

R0067 THE RESTRICTIONS ARE -
R0068 1. A NEGATIVE DESIRED TIME MUST BE LESS THAN ONE PERIOD IN MAGNITUDE. IF GREATER, THE ONE-PERIOD- SOLUTION
R0070 WILL BE RETURNED.
R0071 2. THE PARAMETERS IN THE PROBLEM CANNOT EXCEED THEIR SCALING LIMITS AS SPECIFIED IN THE GSOP. IF
R0073 ANY OF THESE LIMITS ARE EXCEEDED, THE RESULTING SOLUTION WILL BE MEANINGLESS.
R0075

R0076 THE NUMBER OF ITERATIONS AND, THEREFORE, THE COMPUTATION SPEED IS DEPENDENT ON THE ACCURACY OF THE
R0078 GUESS, XKEPNEW. THE AGC COMPUTATION TIME IS APPROXIMATELY .061 SECONDS FOR INITIALIZATION, .065 SECONDS FOR THE
R0080 FINAL COMPUTATIONS, PLUS .083 SECONDS FOR EACH ITERATION.
R0081

R0082 REFERENCES -
R0083 R-479, MISSION PROGRAMMING DEFINITION MEMO NO. 10, LUNAR LANDING MISSION GSOP, SECTION 5.5, SGA
R0085 MEMO 67-4.
R0086

R0087 INPUT - ERASABLE INITIALIZATION REQUIRED

R0088 * SCALE FACTOR *
R0089 VARIABLE*IN POWERS OF 2* DESCRIPTION AND REMARKS
R0090 --------*--------------* -----------------------
R0091 RRECT * +29 FOR EARTH*DP INITIAL POSITION VECTOR IN METERS
R0092 * +27 FOR MOON *
R0093 VRECT * +7 FOR EARTH *DP INITIAL VELOCITY VECTOR IN METERS/CENTISECOND
R0094 * +5 FOR MOON *
R0095 X1 (36D)* NONE *INDEX REGISTER SET TO -2D OR -10D ACCORDING TO WHETHER THE EARTH OR MOON,
R0097 * *RESPECTIVELY, IS THE CENTRAL BODY
R0098 TAU * +28 *DESIRED TRANSFER TIME IN CENTISECONDS (DP)

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R0099   XKEPNEW * +17 FOR EARTH*GUESS OF X IN METERS-TO-THE-ONE-HALF FROM KEPPREP
R0101           * +16 FOR MOON *(DP)
R0102   TC      * +28          *DP PREV. VALUE OF TIME IN CENTISECS FROM KEPPREP
R0103   XPREV   * +17 FOR EARTH*PREVIOUS VALUE OF X IN METERS-TO-THE-ONE-HALF POWER FROM KEPPREP (DP)
R0105           * +16 FOR MOON *(DP)
R0106


R0107   SUBROUTINES CALLED -
R0108        CSMTIME
R0109


R0110   CALLING SEQUENCE AND NORMAL EXIT MODES -

R0111   KEPRTN-2 GOTO                    MUST BE IN INTERPRETIVE MODE AND OVFIND MUST BE CLEAR
R0113   KEPRTN-1       KEPLER           RETURNS WITH XPREV IN MPAC. PL IS AT 0.
R0114   KEPRTN  ...                     CONTINUE

R0115   KEPLER MUST NOT BE CALLED DIRECTLY SINCE AN INTERRUPTION OF IT WOULD DESTROY THE ERASABLES IT NEEDS TO COMPLETE
R0117   THE INTERRUPTED JOB.  THEREFORE THE USER MUST CALL CSMCONIC OR LEMCONIC WHICH GUARANTEES NO INTERRUPTS AND WHICH
R0119   ALSO CALLS KEPPREP TO COMPUTE A GUESS OF XKEPNEW.
R0120


R0121   ABORT EXIT MODES -
R0122        NONE
R0123


R0124   OUTPUT -

R0125           * SCALE FACTOR *
R0126   VARIABLE*IN POWERS OF 2*                    DESCRIPTION AND REMARKS
R0127   --------*--------------*                    -----------------------
R0128   RCV     * +29 FOR EARTH*DP TERMINAL POSITION VECTOR IN METERS
R0129           * +27 FOR MOON *
R0130   VCV     * +7 FOR EARTH *DP TERMINAL VELOCITY VECTOR IN METERS/CENTISEC
R0131           * +5 FOR MOON  *
R0132   TC      * +28          *DP TRANSFER TIME IN CENTISECS TO WHICH KEPLER CONVERGED.
R0134   XPREV   * +17 FOR EARTH*DP X IN METERS-TO-THE-ONE-HALF-POWER TO WHICH KEPLER CONVERGED.
R0136           * +16 FOR MOON *(DP)
R0137   FOR OTHER OUTPUT WHICH MAY BE OF USE, SEE DEBRIS.
R0138


R0139   DEBRIS -

R0140        PARAMETERS WHICH MAY BE OF USE -
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R0141           * SCALE FACTOR *
R0142   VARIABLE*IN POWERS OF 2*                    DESCRIPTION AND REMARKS
R0143   --------*--------------*                    -----------------------
R0144   URRECT  * +1           *DP UNIT VECTOR OF INITIAL POSITION
R0145   R1      * +29 FOR EARTH*DP MAGNITUDE OF INITIAL POSITION IN METERS
R0146           * +27 FOR MOON *
R0147   ALPHA   * -22 FOR EARTH*DP INVERSE OF SEMIMAJOR AXIS IN 1/METERS
R0148           * -20 FOR MOON *
R01481  TMODULO * +28          *DP INTEGRAL NUMBER OF PERIODS IN  CENTISECS. WHICH WAS SUBTRACTED FROM TAU. TO PRODUCE A
R01483          *              *TAU. OF LESS THAN ONE PERIOD.

R0149       PARAMETERS OF NO USE -
R0150   DP PARAMETERS - EPSILONT, DELX, DELT, RONORM, XMODULO, PLUS PUSHLIST REGISTERS 0 THROUGH 39D.
R0152
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L CONIC SUBROUTINES USER'S PAGE NO. 5 EO 53

P0153 PROGRAM DESCRIPTION - LAMBERT SUBROUTINE DATE - 1 SEPTEMBER 1967
R0155 MOD NO. - 0 LOG SECTION - CONIC SUBROUTINES
R0157 MOD BY KRALSE ASSEMBLY - COLOSSUS REVISION 88
R0159

R0160 FUNCTIONAL DESCRIPTION -

R0161 THIS SUBROUTINE CALCULATES THE INITIAL VELOCITY REQUIRED TO TRANSFER A POINT-MASS ALONG A CONIC TRAJECTORY
R0163 FROM AN INITIAL POSITION TO A TERMINAL POSITION IN A PRESCRIBED TIME INTERVAL. THE RESULTING TRAJECTORY MAY BE
R0165 A SECTION OF A CIRCLE, ELLIPSE, PARABOLA, OR HYPERBOLA WITH RESPECT TO THE EARTH OR THE MOON. THE USE OF THE
R0167 SUBROUTINE CAN BE EXTENDED USING OTHER PRIMARY BODIES BY SIMPLE ADDITIONS TO THE MUTABLE WITHOUT INTRODUCING ANY
R0169 CODING CHANGES, ACCEPTING THE INHERENT SCALE FACTOR CHANGES IN POSITION AND VELOCITY. AN ITERATION TECHNIQUE IS
R0171 UTILIZED IN THE COMPUTATION.
R0172

R0173 THE RESTRICTIONS ARE -
R0174 1. RECTILINEAR TRAJECTORIES CANNOT BE COMPUTED.
R0175 2. AN ACCURACY DEGRADATION OCCURS AS THE COSINE OF THE TRUE ANOMALY DIFFERENCE APPROACHES +1.0.
R0177 3. THE ANGLE BETWEEN ANY POSITION VECTOR AND ITS VELOCITY VECTOR MUST BE GREATER THAN 1 DEGREE 47.5 MINUTES
R0179 AND LESS THAN 178 DEGREES 12.5 MINUTES.
R0180 4. NEGATIVE TRANSFER TIME IS AMBIGUOUS AND WILL RESULT IN NO SOLUTION.
R0182 5. THE PARAMETERS IN THE PROBLEM MUST NOT EXCEED THEIR SCALING LIMITS SPECIFIED IN THE GSOP. IF THE
R0184 LIMITS ARE EXCEEDED, THE RESULTING SOLUTION WILL BE MEANINGLESS.
R0185 THE NUMBER OF ITERATIONS AND, THEREFORE, THE COMPUTATIONS SPEED IS DEPENDENT ON THE ACCURACY OF THE FIRST
R0187 GUESS OF THE INDEPENDENT VARIABLE, COGA. THE AGC COMPUTATION TIME IS APPROXIMATE-
R0189 LY .105 SECONDS FOR INITIALIZATION, .069 SECONDS FOR FINAL COMPUTATIONS, PLUS .209 SECONDS FOR EACH ITERATION.
R0191

R0192 REFERENCES -
R0193 R-479, MISSION PROGRAMMING DEFINITION MEMO NO. 10, LUNAR LANDING MISSION GSOP-SECTION 5.5, SGA MEMO 67-8,
R0195 SGA MEMO 67-4.
R0196

R0197 INFLT - ERASABLE INITIALIZATION REQUIRED

R0198 * SCALE FACTOR *
R0199 VARIABLE*IN POWERS OF 2* DESCRIPTION AND REMARKS
R0200 --------*--------------* ----------
R0201 R1VEC * +29 FOR EARTH*DP INITIAL POSITION VECTOR IN METERS
R0202 * +27 FOR MOON *
R0203 R2VEC * +29 FOR EARTH*DP TARGET OR TERMINAL POSITION VECTOR IN METERS
R0204 * +27 FOR MOON *
R0205 TDESIRED* +28 *DP DESIRED TRANSFER TIME IN CENTISECONDS
R0206 X1 (38D)* NONE *INDEX REGISTER SET TO -2D OR -10D ACCORDING TO WHETHER THE EARTH OR MOON,
R0208 * *RESPECTIVELY, IS THE CENTRAL BODY
R0209 GEOMSGN * NONE *SP +.5 IF DESIRED TRANSFER ANGLE IS LESS THAN 180 DEGREES, -.5 IF GREATER THAN 180 DEG.
R0211 GUESSW * NONE *AN INTERPRETER SWITCH TO BE SET IF NO GUESS OF COGA IS AVAILABLE, CLEAR IF A GUESS OF

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R0213           *               *CCGA IS TO BE USED BY LAMBERT
R0214   CCCA    * +5            *DP GUESS OF COTANGNT OF FLIGHT PATH ANGLE (MEASURED FROM VERTICAL).  THIS WILL BE
R0216                           *IGNORED IF GUESSW IS SET.
R0217   NORMSW  * NONE          *AN INTERPRETER SWITCH TO BE SET IF UN IS TO BE AN INPUT TO THE SUBROUTINE, CLEAR IF
R0219           *               *LAMBERT IS TO COMPUTE ITS OWN NORMAL (UN).
R0220   UN      * +1            *DP UNIT  NORMAL TO THE DESIRED ORBIT PLANE IN THE DIRECTION OF THE RESULTING ANGULAR
R0222           *               *MOMENTUM VECTOR.  THIS WILL BE IGNORED IF NORMSW IS CLEAR.
R0224   VTARGTAG* NONE          *A S.P. TAG TO BE SET TO ZERO IF LAMBERT IS TO COMPUTE THE VELOCITY AT R2VEC AS WELL AS
R0226           *               *AT R1VEC.
R0227


R0228   SUBROUTINES CALLED -
R0229       GEOM, GETX, DELTIME, ITERATOR, LAMENTER (PART OF NEWSTATE)
R0230


R0231   CALLING SEQUENCE AND NORMAL EXIT MODES -

R0232   L       CALL                    MUST BE IN INTERPRETIVE MODE AND OVFIND MUST BE CLEAR
R0234   L+1             LAMBERT         RETURNS WITH PL AT 0 AND WITH VVEC IN MPAC IF VTARGTAG WAS NON-ZERO OR VTARGET
R0236                                   IN MPAC IF VTARGTAG WAS ZERO
R0237   L+2     BCN                     CONTINUE IF SOLNSW CLEAR SINCE SOLUTION IS ACCEPTABLE
R0239   L+3             SOLNSW
R0240   L+4             LAMABORT
R0241       IF A LAMBERT RESULT IS TO BE A FIRST GUESS FOR THE NEXT LAMBERT CALCULATION, COGA MUST BE PRESERVED AND
R0243   GUESSW MUST BE CLEAR FOR EACH SUCCEEDING LAMBERT CALL.
R0244


R0245   ABORT EXIT MODES -
R0246       IF SOLNSW WAS SET UPON EXITING, EITHER LAMBERT WAS ASKED TO COMPUTE A TRANSFER TOO NEAR 0 OR 360 DEG, OR T
R0248   WAS TOO SMALL TO PRODUCE A REALISTIC TRANSFER BETWEEN R1VEC AND R2VEC.  IN EITHER CASE THE FIX MUST BE MADE
R0250   ACCORDING TO THE NEEDS OF THE PARTICULAR USER.  THE ABORT EXIT MODE MAY BE CODED AS ...
R0252   LAMABORT DLOAD  ABS             A MEASURE OF PROXIMITY TO 0 OR
R0253                   1-COSTH         360 DEGREES.
R0254           DSU     BMN
R0255                   ONEBIT
R0256                   CHANGER2        CHANGE R2VEC DIRECTION SLIGHTLY.
R0257           DLOAD   DAD
R0258                   TDESIRED
R0259                   SCMETIME
R0260           STCALL  TDESIRED        INCREASE TDESIRED
R0261                   LAMBERT
R0262


R0263   OUTPUT -
R0264           * SCALE FACTOR *
R0265   VARIABLE*IN POWERS OF 2*                        DESCRIPTION AND REMARKS
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R0266   --------*--------------*                    ----------------------
R0267   VVEC    * +7 FOR EARTH *DP INITIAL VELOCITY VECTOR IN METERS/CENTISECOND REQUIRED TO SATISFY THE BOUNDARY VALUE
R0269           * +5 FOR MOON  *PROBLEM.
R0270   VTARGET * +7 FOR EARTH *DP RESULTANT VELOCITY VECTOR AT R2VEC IN METERS/CENTISECOND.
R0272           * +5 FOR MOON  *
R0273   SOLNSW  * NONE         *INTERPRETER SWITCH WHICH IS SET IF THE SUBROUTINE CANNOT SOLVE THE PROBLEM, CLEAR IF THE
R0275           *              *SOLUTION EXISTS.
R0276   FOR OTHER OUTPUT WHICH MAY BE OF USE, SEE DEBRIS.
R0277


R0278   DEBRIS -
R0279        PARAMETERS WHICH MAY BE OF USE -

R0280           * SCALE FACTOR *
R0281   VARIABLE*IN POWERS OF 2*                    DESCRIPTION AND REMARKS
R0282   --------*--------------*                    ----------------------
R0283   SNTH    * +1           *DP SIN OF ANGLE BETWEEN R1VEC AND R2VEC
R0284   CSTH    * +1           *DP COSINE OF ANGLE
R0285   1-CSTH  * +2           *DP 1-CSTH
R0286   COTA    * +5           *DP COTAN OF INITIAL REQUIRED FLIGHT PATH ANGLE MEASURED FROM VERTICAL
R0289   P       * +4           *DP RATIO  OF SEMILATUS RECTUM TO INITIAL RADIUS
R0290   R1A     * +6           *DP RATIO OF INITIAL RADIUS TO SEMIMAJOR AXIS
R0291   R1 (32D)* +29 FOR EARTH*DP INITIAL RADIUS IN METERS
R0292           * +27 FOR MOON *
R0293   UR1     * +1           *DP UNIT VECTOR OF R1VEC
R0294   U2      * +1           *DP UNIT VECTOR OF R2VEC

R0295        PARAMETERS OF NO USE
R0296   DP PARAMETERS - EPSILONL, COSTH-RHO, TPREV, TERRLAMB, R2, RTNLAMB (SP),  PLUS PUSHLIST REGISTER 0 THROUGH 41D
R0298   ADDITIONAL INTERPRETIVE SWITCHES USED - INFINFLG, 360SW, SLOPESW, ORDERSW
R0300
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R0301 PROGRAM DESCRIPTION - TIME-THETA SUBROUTINE DATE - 1 SEPTEMBER 1967
R0303 MOD NO. - 0 LOG SECTION - CONIC SUBROUTINES
R0305 MOD BY KRALSE ASSEMBLY - COLOSSUS REVISION 88
R0307

R0308 FUNCTIONAL DESCRIPTION -

R0309 THIS SUBROUTINE, GIVEN AN INITIAL STATE VECTOR AND A DESIRED TRUE-ANOMALY-DIFFERENCE THROUGH WHICH THE
R0311 STATE IS TO BE UPDATED ALONG A CONIC TRAJECTORY, CALCULATES THE CORRESPONDING TIME-OF-FLIGHT AND, IN ADDITION,
R0313 PROVIDES THE OPTION OF COMPUTING THE NEW UPDATED STATE VECTOR. THE RESULTING TRAJECTORY MAY BE A SECTION OF A
R0315 CIRCLE, ELLIPSE, PARABOLA, OR HYPERBOLA WITH RESPECT TO THE EARTH OR THE MOON. THE USE OF THE SUBROUTINE CAN BE
R0317 EXTENDED USING OTHER PRIMARY BODIES BY SIMPLE ADDITIONS TO THE MUTABLE WITHOUT INTRODUCING ANY CODING CHANGES,
R0319 ACCEPTING THE INHERENT SCALE FACTOR CHANGES IN POSITION AND VELOCITY.
R0320

R0321 THE RESTRICTIONS ARE -
R0322 1. THE ANGLE BETWEEN ANY POSITION VECTOR AND ITS VELOCITY VECTOR MUST BE GREATER THAN 1 DEGREE 47.5 MINUTES
R0324 AND LESS THAN 178 DEGREES 12.5 MINUTES.
R0325 2. THE PARAMETERS IN THE PROBLEM MUST NOT EXCEED THEIR SCALING LIMITS SPECIFIED IN THE GSOP. IF THE LIMITS
R0327 ARE EXCEEDED, THE RESULTING SOLUTION WILL BE MEANINGLESS.

R0328 THE AGC COMPUTATION TIME IS APPROXIMATELY .292 SECONDS.
R0329

R0330 REFERENCES -
R0331 R-479, MISSION PROGRAMMING DEFINITION MEMO NO. 10, LUNAR LANDING MISSION GSOP-SECTION 5.5, SGA MEMO 67-8.
R0333

R0334 INPUT - ERASABLE INITIALIZATION REQUIRED

		SCALE FACTOR	
R0336	VARIABLE	IN POWERS OF 2	DESCRIPTION AND REMARKS
R0338	RVEC	+29 FOR EARTH	DP INITIAL POSITION VECTOR IN METERS
R0339		+27 FOR MOON	
R0340	VVEC	+7 FOR EARTH	DP INITIAL VELOCITY VECTOR IN METERS/CENTISECOND
R0341		+5 FOR MOON	
R0342	SNTH	+1	DP SINE OF TRUE-ANOMALY-DIFFERENCE THROUGH WHICH THE STATE IS TO BE UPDATED
R0344	CSTH	+1	DP COSINE OF THE ANGLE
R0345	RVSW	NONE	AN INTERPRETIVE SWITCH TO BE SET IF ONLY TIME IS TO BE AN OUTPUT, CLEAR IF THE NEW STATE
R0347			IS TO BE COMPUTED ALSO.
R0348	X1 (38D)	NONE	INDEX REGISTER TO BE SET TO -2D OR -10D ACCORDING TO WHETHER THE EARTH OR MOON,
R0350			RESPECTIVELY, IS THE CENTRAL BODY.
R0351			

R0352 SUBROUTINES CALLED -

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R0353          PARAM, GEOM, GETX, DELTIME, NEWSTATE
R0354
R0355   CALLING SEQUENCE AND NORMAL EXIT MODES -
R0356       IF ONLY TIME IS DESIRED AS OUTPUT -
R0357   L       SET     CALL            MUST BE IN INTERPRETIVE MODE AND OVFIND MUST BE CLEAR
R0359   L+1             RVSW
R0360   L+2             TIMETHET        RETURN WITH PL AT 0 AND T IN MPAC
R0361   L+3     ...                     CONTINUE
R0362
R0363       IF THE UPDATE STATE VECTOR IS DESIRED AS WELL -
R0364   L       CLEAR   CALL            MUST BE IN INTERPRETIVE MODE AND OVFIND MUST BE CLEAR
R0366   L+1             RVSW
R0367   L+2             TIMETHET        RETURNS WITH PL AT 6.  THE INITIAL POSITION VECTOR IS IN OD OF THE PUSHLIST AND
R0369                                   THE INITIAL VELOCITY VECTOR IN MPAC.
R0370   L+3     STOVL   NEWVVEC
R0371   L+4     STADR
R0372   L+5     STORE   NEWRVEC                 NEWVVEC AND NEWRVEC ARE SYMBOLIC REPRESENTATIONS OF THE USERS LOCATIONS.
R0374   L+6     ...                             CONTINUE
R0375
R0376   ABORT EXIT MODES -
R0377   L       CALL    BON
R0378   L+1             TIMETHET
R0379   L+2             COGAFLAG
R0380   L+3             COGABORT        RESTRICTION 1 HAS BEEN VIOLATED.
R0381   L+4     BON                     IF NEITHER FLAG IS SET AND RESTRICTION 2 HAS NOT BEEN VIOLATED, THE SOLUTION IS
R0383                                   GOOD, SO CONTINUE
R0384   L+5             INFINFLG
R0385   L+6             IMPOSSBL        NO SOLUTION EXISTS.
R0386
R0387   OUTPUT -
R0388           * SCALE FACTOR *
R0389   VARIABLE*IN POWERS OF 2*                        DESCRIPTION AND REMARKS
R0390   --------*--------------*                        -----------------------
R0391   T (3CC) * +28           *DP TRANSFER TIME IN CENTISECONDS
R0392   INFINFLG* NONE          *AN INTERPRETIVE SWITCH WHICH IS SET IF THE TRANSFER ANGLE REQUIRES CLOSURE THROUGH
R0394           *               *INFINITY (NO SOLUTION), CLEAR IF A PHYSICAL SOLUTION IS POSSIBLE.
R0396   COGAFLAG* NONE          *AN INTERPRETIVE SWITCH WHICH IS SET IF RESTRICTION 1 HAS BEEN VIOLATED (NO SOLUTION),
R0398           *               *CLEAR IF NOT.

R0399   IN ADDITION, IF VTARGTAG IS NON-ZERO, THE FOLLOWING ARE OUTPUT -
R0400   MPAC -  * +7 FOR EARTH *DP TERMINAL VELOCITY VECTOR IN METERS/CENTISEC.
R0401    MPAC +5* +5 FOR MOON  *
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R0402 OD - 5D * +29 FOR EARTH*DP TERMINAL POSITION VECTOR IN METERS (PL AT 6D)
R0403 * +27 FOR MOON *

R0404 FOR OTHER OUTPUT WHICH MAY BE OF USE, SEE DEBRIS.
R0405

R0406 DEBRIS -

R0407 PARAMETERS WHICH MAY BE OF USE -

R0408 * SCALE FACTOR *
R0409 VARIABLE*IN POWERS OF 2* DESCRIPTION AND REMARKS
R0410 ---------*---------- ----------
R0411 R1 (32D)* +29 FOR EARTH*DP MAGNITUDE OF INITIAL POSITION VECTOR, RVEC, IN METERS
R0413 * +27 FOR MOON *
R0414 R1A * +6 *DP RATIO OF R1 TO SEMIMAJOR AXIS (NEG. FOR HYPERBOLIC TRAJECTORIES)
R0416 P * +4 *DP RATIO OF SEMILATUS RECTUM TO R1
R0417 COSA * +5 *DP COSINE OF ANGLE BETWEEN RVEC AND VVEC
R0419 UR1 * +1 *DP UNIT VECTOR OF RVEC
R0420 U2 * +1 *DP UNIT VECTOR OF VVEC
R0421 UN * +1 *DP UNIT VECTOR OF UR1*U2
R0422

R0423 PARAMETERS OF NO USE -
R0424 SP PARAMETERS - RTNTT, GEOMSGN, RTNPRM, MAGVEC2=R2 (DP), PLUS PUSHLIST LOCATIONS 0-11D, 14D-21D, 24D-39D, 41D
R0426 ADDITIONAL INTERPRETIVE SWITCHES USED - NORMSW, 360SW
R0427

L CONIC SUBROUTINES USER'S PAGE NO. 11 EO S3

R0428 PROGRAM DESCRIPTION - TIME-RADIUS SUBROUTINE DATE - 11 OCTOBER 1967
R0430 MOD NO. -1 LOG SECTION - CONIC SUBROUTINES
R0432 MOD BY KRAUSE ASSEMBLY - COLOSSUS REVISION 88
R0434

R0435 FUNCTIONAL DESCRIPTION -

R0436 THIS SUBROUTINE, GIVEN AN INITIAL STATE VECTOR AND A DESIRED RADIUS TO WHICH THE
R0438 STATE IS TO BE UPDATED ALONG A CONIC TRAJECTORY, CALCULATES THE CORRESPONDING TIME-OF-FLIGHT AND, IN ADDITION,
R0440 PROVIDES THE OPTION OF COMPUTING THE NEW UPDATED STATE VECTOR. THE RESULTING TRAJECTORY MAY BE A SECTION OF A
R0442 CIRCLE, ELLIPSE, PARABOLA, OR HYPERBOLA WITH RESPECT TO THE EARTH OR THE MOON. THE USE OF THE SUBROUTINE CAN BE
R0444 EXTENDED USING OTHER PRIMARY BODIES BY SIMPLE ADDITIONS TO THE MUTABLE WITHOUT INTRODUCING ANY CODING CHANGES,
R0446 ACCEPTING THE INHERENT SCALE FACTOR CHANGES IN POSITION AND VELOCITY.
R0447 IF THE DESIRED RADIUS IS BEYOND THE RADIUS OF APOCENTER OF THE CONIC OR BELOW THE RADIUS OF PERICENTER,
R0449 APSESW WILL BE SET AND THE SUBROUTINE WILL RETURN THE APOCENTER OR PERICENTER SOLUTION, RESPECTIVELY.
R0451

R0452 THE RESTRICTIONS ARE -
R0453 1. THE ANGLE BETWEEN ANY POSITION VECTOR AND ITS VELOCITY VECTOR MUST BE GREATER THAN 1 DEGREE 47.5 MINUTES
R0455 AND LESS THAN 178 DEGREES 12.5 MINUTES.
R0456 2. THE PARAMETERS IN THE PROBLEM MUST NOT EXCEED THEIR SCALING LIMITS SPECIFIED IN THE GSOP. IF THE LIMITS
R0458 ARE EXCEEDED, THE RESULTING SOLUTION WILL BE MEANINGLESS.
R04581 3. AN ACCURACY DEGRADATION OCCURS AS THE SENSITIVITIES OF TIME AND UPDATED STATE VECTOR TO CHANGES IN
R04583 RDESIRED INCREASE. THIS WILL OCCUR NEAR EITHER APSIS OF THE CONIC AND WHEN THE CONIC IS NEARLY CIRCULAR. IN
R04585 PARTICULAR, IF THE CONIC IS AN EXACT CIRCLE, THE PROBLEM IS UNDEFINED AND THE SUBROUTINE WILL ABORT.
R04587

R0459 THE AGC COMPUTATION TIME IS APPROXIMATELY .363 SECONDS
R0460

R0461 REFERENCES -
R0462 R-479, MISSION PROGRAMMING DEFINITION MEMO NO. 10, LUNAR LANDING MISSION GSOP-SECTION 5.5, SGA MEMO 67-8.
R0464

R0465 INPUT - ERASABLE INITIALIZATION REQUIRED

R0466		* SCALE FACTOR *	
R0467	VARIABLE	*IN POWERS OF 2*	DESCRIPTION AND REMARKS
R0468	---------	-------------	----------
R0469	RVEC	* +29 FOR EARTH	*DP INITIAL POSITION VECTOR IN METERS
R0470		* +27 FOR MOON	*
R0471	VVEC	* +7 FOR EARTH	*DP INITIAL VELOCITY VECTOR IN METERS/CENTISECOND
R0472		* +5 FOR MOON	*
R0473	RDESIRED	* +29 FOR EARTH	*DP TERMINAL RADIAL DISTANCE ON CONIC TRAJECTORY FOR WHICH TRANSFER TIME IS TO BE
R0475		* +27 FOR MOON	*COMPUTED.
R0476	SGNRDOT	* NONE	*SP TAG SET TO +.5 OR -.5 ACCORDING TO WHETHER THE RADIAL VELOCITY AT RDESIRED IS TO BE
R0478		*	*POSITIVE OR NEGATIVE, RESPECTIVELY. THIS TAG REDUCES THE DOUBLE-VALUED PROBLEM TO A

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R0480           *               *SINGLE-VALUED PROBLEM.
R0481   X1 (38D)*NONE            *INDEX REGISTER TO BE SET TO -2D OR -10D ACCORDING TO WHETHER THE EARTH OR MOON,
R0483           *               *RESPECTIVELY, IS THE CENTRAL BODY.
R0484   RVSW    * NONE          *AN INTERPRETIVE SWITCH TO BE SET IF ONLY TIME IS TO BE AN OUTPUT, CLEAR IF THE NEW STATE
R0486           *               *IS TO BE COMPUTED ALSO.
R0487


R0488   SUBROUTINES CALLED -
R0489        PARAM, GEOM, GETX, DELTIME, NEWSTATE
R0490


R0491   CALLING SEQUENCE AND NORMAL EXIT MODES -

R0492      IF ONLY TIME IS DESIRED AS OUTPUT -
R0493   L          SET     CALL            MUST BE IN INTERPRETIVE MODE AND OVFIND MUST BE CLEAR
R0495   L+1                RVSW
R0496   L+2                TIMERAD         RETURN WITH PL AT 0 AND T IN MPAC
R0497   L+3        ...                     CONTINUE
R0498

R0499      IF THE UPDATE STATE VECTOR IS DESIRED AS WELL -
R0500   L          CLEAR   CALL            MUST BE IN INTERPRETIVE MODE AND OVFIND MUST BE CLEAR
R0502   L+1                RVSW
R0503   L+2                TIMERAD         RETURNS WITH PL AT 6.  THE INITIAL POSITION VECTOR IS IN OD OF THE PUSHLIST AND
R0505                                      THE INITIAL VELOCITY VECTOR IN MPAC.
R0506   L+3        STOVL   NEWVVEC
R0507   L+4        STADR
R0508   L+5        STORE   NEWRVEC             NEWVVEC AND NEWRVEC ARE SYMBOLIC REPRESENTATIONS OF THE USERS LOCATIONS.
R0510   L+6        ...                         CONTINUE
R0511


R0512   ABORT EXIT MODES -
R0513   L          CALL    BON
R0514   L+1                TIMERAD
R0515   L+2                CCGAFLAG
R0516   L+3                CCGABORT        RESTRICTION 1 HAS BEEN VIOLATED.
R0517   L+4        BON     BON
R0520   L+5                INFINFLG
R0521   L+6                IMPOSSBL        NO SOLUTION EXISTS.
R05211  L+7                SCLNSW
R05212  L+8                IMPOSSBL        SOLUTION IS UNDEFINED SINCE CONIC IS A CIRCLE.  RESTRICTION 3 HAS BEEN VIOLATED.
R05214  L+9        ...                     IF ALL THREE OF THE FLAGS ARE CLEAR, A SOLUTION EXISTS, SO CONTINUE.
R0522


R0523   OUTPUT -
R0524           * SCALE FACTOR *
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R0525   VARIABLE*IN POWERS OF 2*                    DESCRIPTION AND REMARKS
R0526   --------*--------------*                    -----------------------
R0527   T (30D) * +28           *DP TRANSFER TIME IN CENTISECONDS
R0528   INFINFLG* NONE          *AN INTERPRETIVE SWITCH WHICH IS SET IF RDESIRED AND SGNRDOT REQUIRE CLOSURE THROUGH
R0530           *               *INFINITY (NO SOLUTION), CLEAR IF A PHYSICAL SOLUTION IS POSSIBLE.
R0532   CCGAFLAG* NONE          *AN INTERPRETIVE SWITCH WHICH IS SET IF RESTRICTION 1 HAS BEEN VIOLATED (NO SOLUTION),
R0534           *               *CLEAR IF NOT.
R0535   APSESW  * NONE          *AN INTERPRETIVE SWITCH WHICH IS SET IF RDESIRED WAS GREATER THAN RADIUS OF APOCENTER OR
R0537           *               *LESS THAN RADIUS OF PERICENTER.  THE APOCENTER OR PERICENTER SOLUTION, RESPECTIVELY,
R0539           *               *WILL THEN BE RETURNED.  THE SWITCH IS CLEAR IF RDESIRED WAS BETWEEN PERICENTER AND
R0541           *               *APOCENTER.
R05411  SGLNSW  * NONE          *AN INTERPRETIVE SWITCH WHICH IS SET IF THE CONIC IS SO CLOSE TO A CIRCLE THAT THE TERMIN
R05413                          *POINT IS AMBIGUOUS, VIOLATING RESTRICTION 3.  IF ECCENTRICITY IS GREATER THAN 2-TO-THE-
R05415                          *MINUS-18, THE SWITCH IS CLEAR.
R0542

R0543   IN ADDITION, IF VTARGTAG IS NON-ZERO, THE FOLLOWING ARE OUTPUT -

R0544   MPAC -   * +7 FOR EARTH *DP TERMINAL VELOCITY VECTOR IN METERS/CENTISEC.
R0545    MPAC +5* +5 FOR MOON   *
R0546   QD - 5D * +29 FOR EARTH*DP TERMINAL POSITION VECTOR IN METERS (PL AT 6D)
R0547           * +27 FOR MOON *

R0548   FOR OTHER OUTPUT WHICH MAY BE OF USE, SEE DEBRIS.
R0549


R0550   DEBRIS -

R0551        PARAMETERS WHICH MAY BE OF USE -

R0552             * SCALE FACTOR *
R0553   VARIABLE*IN POWERS OF 2*                    DESCRIPTION AND REMARKS
R0554   --------*--------------*                    -----------------------
R0555   R1 (32D)* +29 FOR EARTH*DP MAGNITUDE OF INITIAL POSITION VECTOR, RVEC, IN METERS
R0557           * +27 FOR MOON *
R0558   R1A      * +6            *DP RATIO OF R1 TO SEMIMAJOR AXIS (NEG. FOR HYPERBOLIC TRAJECTORIES)
R0560   P        * +4            *DP RATIO OF SEMILATUS RECTUM TO R1
R0561   COTA     * +5            *DP COTAN OF ANGLE BETWEEN RVEC AND VVEC
R0563   UR1      * +1            *DP UNIT VECTOR OF RVEC
R0564   U2       * +1            *DP UNIT VECTOR OF VVEC
R0565   UN       * +1            *DP UNIT VECTOR OF UR1*U2
R0566   CSTH     * +1            *DP COSINE OF TRUE ANOMALY DIFFERENCE BETWEEN RVEC AND RDESIRED.
R0568   SNTH     * +1            *DP SINE OF TRUE ANOMALY DIFFERENCE.
R0569

R0570        PARAMETERS OF NO USE -
R0571   SP PARAMETERS -  RTNTT, GEOMSGN, RTNPRM, MAGVEC2=R2 (DP), PLUS PUSHLIST LOCATIONS 0-11D, 14D-21D, 24D-39D, 41D
R0573   ADDITIONAL INTERPRETIVE SWITCHES USED - NORMSW, 360SW
R0574
```

P0575 PROGRAM DESCRIPTION - APSIDES SUBROUTINE DATE - 1 SEPTEMBER 1967
R0577 MOD NO. - 0 LOG SECTION - CONIC SUBROUTINES
R0579 MOD BY KRAUSE ASSEMBLY - COLOSSUS REVISION 88
R0581

R0582 FUNCTIONAL DESCRIPTION -

R0583 THIS SUBROUTINE, GIVEN AN INITIAL STATE VECTOR CALCULATES THE RADIUS OF PERICENTER AND OF APOCENTER AND THE
R0585 ECCENTRICITY OF THE RESULTING CONIC TRAJECTORY, WHICH MAY BE A STRAIGHT LINE,
R0587 CIRCLE, ELLIPSE, PARABOLA, OR HYPERBOLA WITH RESPECT TO THE EARTH OR THE MOON. THE USE OF THE SUBROUTINE CAN BE
R0589 EXTENDED USING OTHER PRIMARY BODIES BY SIMPLE ADDITIONS TO THE MUTABLE WITHOUT INTRODUCING ANY CODING CHANGES,
R0591 ACCEPTING THE INHERENT SCALE FACTOR CHANGES IN POSITION AND VELOCITY.
R0592

R0593 THE RESTRICTIONS ARE -
R0594 1. IF APOCENTER IS BEYOND THE SCALING OF POSITION, THE SCALE FACTOR LIMIT (536,870,910 METERS WITH RESPECT
R0596 TO THE EARTH OR 134,217,727.5 METERS WITH RESPECT TO THE MOON) WILL BE RETURNED.
R0598 2. THE PARAMETERS IN THE PROBLEM MUST NOT EXCEED THEIR SCALING LIMITS SPECIFIED IN THE GSOP. IF THE LIMITS
R0600 ARE EXCEEDED, THE RESULTING SOLUTION WILL BE MEANINGLESS.

R0601 THE ACC COMPUTATION TIME IS APPROXIMATELY .103 SECONDS.
R0602

R0603 REFERENCES -
R0604 MISSION PROGRAMMING DEFINITION MEMO NO. 10, LUNAR LANDING MISSION GSOP-SECTION 5.5
R0606

R0607 INPUT - ERASABLE INITIALIZATION REQUIRED

R0608		* SCALE FACTOR *	
R0609	VARIABLE	*IN POWERS OF 2*	DESCRIPTION AND REMARKS
R0610	--------	*-------------*	----------
R0611	RVEC	* +29 FOR EARTH	*DP INITIAL POSITION VECTOR IN METERS
R0612		* +27 FOR MOON	*
R0613	VVEC	* +7 FOR EARTH	*DP INITIAL VELOCITY VECTOR IN METERS/CENTISECOND
R0614		* +5 FOR MOON	*
R0615	X1 (38D)	*NONE	*INDEX REGISTER TO BE SET TO -2D OR -1CD ACCORDING TO WHETHER THE EARTH OR MOON,
R0617		*	*RESPECTIVELY, IS THE CENTRAL BODY.

R0618

R0619 SUBROUTINES CALLED -
R0620 PARAM, GEOM
R0621

R0622 CALLING SEQUENCE AND NORMAL EXIT MODES -

```
R0623       IF ONLY TIME IS DESIRED AS OUTPUT -
R0624  L     CALL                MUST BE IN INTERPRETIVE MODE AND OVFIND MUST BE CLEAR.
R0626  L+1           APSIDES     RETURNS WITH PL AT 0, RADIUS OF APOCENTER IN MPAC AND RADIUS OF PERICENTER IN OD
R0628  L+2     STODL APOAPSE
R0629  L+3           OD
R0630  L+4     STORE PERIAPSE            APOAPSE AND PERIAPSE ARE SYMBOLIC REPRESENTATIONS OF THE USERS LOCATIONS
R0632  L+5     ...                 CONTINUE
R0633
```

```
R0634  OUTPUT -
R0635          * SCALE FACTOR *
R0636  VARIABLE*IN POWERS OF 2*                    DESCRIPTION AND REMARKS
R0637  --------*--------------*                    -----------------------
R0638  MPAC    * +29 FOR EARTH*DP RADIUS OF APOCENTER IN METERS
R0639          * +27 FOR MOON *
R0640  OD-ID   * +29 FOR EARTH*DP RADIUS OF PERICENTER IN METERS
R0641          * +27 FOR MOON *
R0642  ECC     * +3            *DP ECCENTRICITY OF CONIC TRAJECTORY.

R0643  FOR OTHER OUTPUT WHICH MAY BE OF USE, SEE DEBRIS.
R0644
```

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R0645  DEBRIS -

R0646       PARAMETERS WHICH MAY BE OF USE -

R0647          * SCALE FACTOR *
R0648  VARIABLE*IN POWERS OF 2*                    DESCRIPTION AND REMARKS
R0649  --------*--------------*                    -----------------------
R0650  R1 (32D)* +29 FOR EARTH*DP MAGNITUDE OF INITIAL POSITION VECTOR, RVEC, IN METERS
R0652          * +27 FOR MOON *
R0653  R1A     * +6            *DP RATIO OF R1 TO SEMIMAJOR AXIS (NEG. FOR HYPERBOLIC TRAJECTORIES)
R0655  P       * +4            *DP RATIO OF SEMILATUS RECTUM TO R1
R0656  COCA    * +5            *DP COTAN OF ANGLE BETWEEN RVEC AND VVEC
R0658  UR1     * +1            *DP UNIT VECTOR OF RVEC
R0659  U2      * +1            *DP UNIT VECTOR OF VVEC
R0660  UN      * +1            *DP UNIT VECTOR OF UR1*U2
R0661  MAGVEC2 * +7 FOR EARTH *DP MAGNITUDE OF VVEC
R0662          * +5 FOR MOON  *
R0663
```

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R0664       PARAMETERS OF NO USE -
R0665  SP PARAMETERS - RTNAPSE, GEOMSGN, RTNPRM, PLUS PUSHLIST LOCATIONS 0-5,100-110, 140-210, 310-380.
R0667  ADDITIONAL INTERPRETIVE SWITCHES USED - NORMSW
R0668
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 0669  REF   1            12,2000                    SETLOC CONICS
```

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0670                        12,2000                 BANK

0671  REF   1                                       COUNT  12/CONIC

0672  REF   2  LAST   93    E5,1723                 EBANK= UR1
0678                        12,2000   71201 1 KEPLERN SETPD  DLOAD
0679                        12,2001   00001 0         0
0680  REF   1               12,2002   11453 C         KEPZERO
0681  REF   1               12,2003   01344 C         STORE  XMODLLO
0682  REF   1               12,2004   31346 1         STOVL* TMODULO
0683  REF   5  LAST  546    12,2005   11626 C         MUTABLE,1
0684                        12,2006   24017 1         STOVL  14D
0685  REF   3  LAST  501    12,2007   01503 C         RRECT
0686                        12,2010   66256 C         UNIT   SSP
0687  REF   1               12,2011   00027 1         ITERCTR
0688                        12,2012   00024 1         20D
0689  REF   2  LAST   93    12,2013   16647 C         STODL  URRECT
0690                        12,2014   00045 C         36D
0691  REF   2  LAST  858    12,2015   24041 1         STOVL  R1
0692  REF   4  LAST 1243    12,2016   01503 C         RRECT
0693                        12,2017   76441 1         DOT    SL1R
0694  REF   2  LAST   82    12,2020   01511 C         VRECT
0695                        12,2021   76405 1         DMP    SL1R
0696  REF   1               12,2022   00023 C         1/ROOTMU          1/ROOTMU (-17 OR -14)
0697  REF   1               12,2023   24043 C         STOVL  KEPC1      C1=R.V/ROOTMU (+17 OR +16)

0698  REF   3  LAST 1243    12,2024   01511 C         VRECT
0699                        12,2025   57236 1         VSQ    DMPR
0700  REF   1               12,2026   00017 1         1/MU              1/MU (-34 OR -28)
0701                        12,2027   52405 1         DMP    SL3
0702  REF   3  LAST 1243    12,2030   00041 1         R1
0703                        12,2031   61425 C         DSU    ROUND
0704  REF   1               12,2032   11475 1         D1/64
0705  REF   1               12,2033   00045 0         STORE  KEPC2      C2=RV.V/MU -1 (+6)

0706                        12,2034   74421 0         BDSU   SR1R
0707  REF   2  LAST 1243    12,2035   11475 1         D1/64
0708                        12,2036   77671 1         DDV
0709  REF   4  LAST 1243    12,2037   00041 1         R1
0710  REF   1               12,2040   00011 1         STORE  ALPHA      ALPHA=(1-C2)/R1 (-22 OR -20)


0711                        12,2041   71244 C         BPL    DLOAD      MAXIMUM X DEPENDS ON TYPE OF CONIC
0712  REF   1               12,2042   24051 C         1REV
0713  REF   1               12,2043   11513 C         -SQSC             -SQSC (+12)
0714                        12,2044   40071 C         DDV    BOV
0715  REF   2  LAST 1243    12,2045   00011 1         ALPHA
0716  REF   1               12,2046   24055 1         STOREMAX
0717                        12,2047   52166 1         SQRT   GOTO
0718  REF   2  LAST 1243    12,2050   24055 1         STOREMAX
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L CONIC SUBROUTINES USER'S PAGE NO. 17 E5 S3

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0719                          12,2051  55366 1  IREV      SQRT    BDDV
0720  REF  2  LAST  547       12,2052  11515 0                    2PISC          2PISC (+6)
0721                          12,2053  77600 1                    BOV
0722  REF  3  LAST 1243       12,2054  24055 1                    STOREMAX
0723                          12,2055  50165 0  STOREMAX  SIGN    BMN
0724  REF  2  LAST   87       12,2056  02312 0                    TAU.
0725  REF  1                  12,2057  24272 0                    BACKWARD
0726  REF  1                  12,2060  00013 0                    STORE   XMAX
0727                          12,2061  65205 0                    DMP     PDDL                                    PL AT 2
0728  REF  2  LAST 1243       12,2062  00023 0                            1/RDOTMU
0729  REF  3  LAST 1243       12,2063  00011 1                            ALPHA
0730                          12,2064  65301 0                    NORM    PDDL           DXCH WITH OD.  OD=ALPHA  PL AT 0,2
0731  REF 57  LAST 1221       12,2065  00047 1                            X1
0732                          12,2066  56257 1                    SL*     DDV                                     PL AT 0
0733                          12,2067  20173 0                            0 -6,1
0734                          12,2070  50000 1  PERIODCH  BOV     BMN
0735  REF  1                  12,2071  24112 0                            MODDONE
0736  REF  2  LAST 1244       12,2072  24112 0                            MODDONE
0737                          12,2073  77606 1                    PUSH                    OD=PERIOD (+28)
0738                          12,2074  50021 1                    BDSU    BMN
0739  REF  3  LAST 1244       12,2075  02312 0                            TAU.
0740  REF  3  LAST 1244       12,2076  24112 0                            MODDONE
0741  REF  4  LAST 1244       12,2077  16312 0                    STODL   TAU.
0742  REF  2  LAST 1244       12,2100  00013 0                            XMAX
0743                          12,2101  77615 0                    DAD
0744  REF  2  LAST 1243       12,2102  01344 0                            XMODLLO
0745  REF  3  LAST 1244       12,2103  15344 0                    STODL   XMODLLO
0746                          12,2104  00001 0                            OD
0747                          12,2105  77615 0                    DAD
0748  REF  2  LAST 1243       12,2106  01346 1                            TMODLLO
0749  REF  3  LAST 1244       12,2107  15346 1                    STODL   TMODLLO                                 PL AT 0
0750                          12,2110  77650 1                    GOTO
0751  REF  1                  12,2111  24070 0                            PERIODCH

0752                          12,2112  71201 1  MODDONE  SETPD   DLOAD
0753                          12,2113  00001 0                            0
0754  REF  2  LAST 1243       12,2114  11453 0                            KEPZERO
0755  REF  1                  12,2115  14015 0                    STODL   XMIN
0756  REF  2  LAST   87       12,2116  02306 0                            XKEPNEW
0757                          12,2117  77625 0                    DSU
0758  REF  4  LAST 1244       12,2120  01344 0                            XMODLLO
0759  REF  1                  12,2121  00025 0                    STORE   X
0760                          12,2122  50054 0                    BZE     BMN
0761  REF  1                  12,2123  24265 0                            BADX
0762  REF  2  LAST 1244       12,2124  24265 0                            BADX
0763                          12,2125  51025 1                    DSU     BPL
0764  REF  3  LAST 1244       12,2126  00013 0                            XMAX
0765  REF  3  LAST 1244       12,2127  24265 0                            BADX
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0766                          12,2130  57345 1  DXCOMP   DLOAD   DMPR
0767  REF   5  LAST 1244     12,2131  02312 C           TAU.
0768  REF   1                 12,2132  11506 1           BEE22
07685                         12,2133  77646 C           ABS
0769  REF   1                 12,2134  15350 C           STODL   EPSILONT
0770  REF   2  LAST   82      12,2135  01551 1           TC
0771                          12,2136  45254 C           BZE     DSU
0772  REF   1                 12,2137  24141 0           NEWTC
0773  REF   4  LAST 1244     12,2140  01346 1           TMODULO
0774  REF   3  LAST 1245     12,2141  15551 1  NEWTC    STODL   TC
0775  REF   1                 12,2142  01553 C           XPREV
0776                          12,2143  45254 C           BZE     DSU
0777  REF   1                 12,2144  24146 1           XDIFF
0778  REF   5  LAST 1244     12,2145  01344 C           XMODULO
0779                          12,2146  77621 1  XDIFF    BDSU
0780  REF   2  LAST 1244     12,2147  00025 C           X
0781  REF   2  LAST   93      12,2150  02643 1           STORE   DELX

0782                          12,2151  63545 C  KEPLOOP  DLOAD   DSQ
0783  REF   3  LAST 1245     12,2152  00025 C           X       X=XKEP
0784                          12,2153  41501 C           NORM    PUSH    OD=XSQ (+34 OR +32 -N1)     PL AT 2
0785  REF  58  LAST 1244     12,2154  00047 1           X1
0786                          12,2155  53605 1           DMP     SRR*
0787  REF   4  LAST 1244     12,2156  00011 1           ALPHA
0788                          12,2157  21573 0           0 -6,1
0789  REF   1                 12,2160  34031 1  STCALL   XI      XI=ALPHA XSQ (+6)
0790  REF   1                 12,2161  24426 1           DELTIME
0791                          12,2162  44200 C  BOV      BDSU
0792  REF   1                 12,2163  24312 1           TIMECVFL    UNLIKELY
0793  REF   6  LAST 1245     12,2164  02312 C           TAU.
0794  REF   2  LAST   93      12,2165  02645 1  STORE    DELT    DELT=DELINDEP
0795                          12,2166  44246 1  ABS      BDSU
0796  REF   2  LAST 1245     12,2167  01350 C           EPSILONT
0797                          12,2170  71244 C  BPL      DLOAD
0798  REF   1                 12,2171  24334 C           KEPCONVG
0799  REF  10  LAST  89C      12,2172  00037 C           T
0800                          12,2173  60225 1  DSU      NORM
0801  REF   4  LAST 1245     12,2174  01551 1           TC
0802  REF  59  LAST 1245     12,2175  00047 1           X1
0803                          12,2176  60325 C  PDDL     NORM
0804  REF   3  LAST 1245     12,2177  02643 1           DELX
0805  REF  31  LAST 1225     12,2200  00050 1           X2
0806                          12,2201  41260 C  XSU,1    DMP
0807  REF  32  LAST 1245     12,2202  00047 1           X2
0808  REF   3  LAST 1245     12,2203  02645 1           DELT
0809                          12,2204  56257 1  SLR*     DDV
0810                          12,2205  21202 1           1,1
0811                          12,2206  41542 1  SR1      PUSH    OD=TRIAL DELX               PL AT 2
0812                          12,2207  71244 C  BPL      DLOAD
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0813  REF  1                 12,2210  24231 1                POSDELX
0814  REF  4  LAST 1245      12,2211  00025 0                X
0815  REF  4  LAST 1244      12,2212  00013 0          STORE XMAX          MOVE MAX BOUND IN
0816                         12,2213  45221 1          BDSU  DSU                          PL AT 0
0817  REF  2  LAST 1244      12,2214  00015 0                XMIN
0818                         12,2215  51000 0          BOV   BPL
0819  REF  1                 12,2216  24223 1                NDXCHNGE
0820  REF  2  LAST 1246      12,2217  24223 1                NDXCHNGE
0821                         12,2220  52145 0          DLOAD GOTO
0822                         12,2221  00001 0                OD
0823  REF  1                 12,2222  24243 1                NEWDELX


0824                         12,2223  45345 1  NDXCHNGE DLOAD DSU
0825  REF  3  LAST 1246      12,2224  00015 0                XMIN
0826  REF  5  LAST 1246      12,2225  00025 0                X
0827                         12,2226  52075 1          DMPR  GOTO          TO FORCE MPAC +2 TO ZERO
0828  REF  1                 12,2227  11511 1                DP9/10
0829  REF  2  LAST 1246      12,2230  24243 1                NEWDELX


0830                         12,2231  77745 1  POSDELX  DLOAD
0831  REF  6  LAST 1246      12,2232  00025 0                X
0832  REF  4  LAST 1246      12,2233  00015 0          STORE XMIN          MOVE MIN BOUND IN
0833                         12,2234  45221 1          BDSU  DSU                          PL AT 0
0834  REF  5  LAST 1246      12,2235  00013 0                XMAX
0835                         12,2236  50000 1          BOV   BMN
0836  REF  1                 12,2237  24257 1                PDXCHNGE
0837  REF  2  LAST 1246      12,2240  24257 1                PDXCHNGE
0838                         12,2241  77745 1          DLOAD
0839                         12,2242  00001 0                OD
0840  REF  4  LAST 1245      12,2243  02643 1  NEWDELX  STORE DELX
0841                         12,2244  43254 0          BZE   DAD
0842  REF  2  LAST 1245      12,2245  24334 0                KEPCONVG
0843  REF  7  LAST 1246      12,2246  00025 0                X
0844  REF  8  LAST 1246      12,2247  14025 0          STODL X
0845  REF  11 LAST 1245      12,2250  00037 0                T
0846  REF  5  LAST 1245      12,2251  01551 1          STORE TC
0847                         12,2252  46034 1  BRNCHCTR RTB   BHIZ
0848  REF  1                 12,2253  24651 0                CHECKCTR
0849  REF  3  LAST 1246      12,2254  24334 0                KEPCONVG
0850                         12,2255  77650 1          GOTO
0851  REF  1                 12,2256  24151 1                KEPLOOP             ITERATE


0852                         12,2257  45345 1  PDXCHNGE DLOAD DSU
0853  REF  6  LAST 1246      12,2260  00013 0                XMAX
0854  REF  9  LAST 1246      12,2261  00025 0                X
0855                         12,2262  52075 1          DMPR  GOTO          TO FORCE MPAC +2 TO ZERO
0856  REF  2  LAST 1246      12,2263  11511 1                DP9/10
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0857   REF   3  LAST 1246   12,2264   24243 1                    NEWDELX


0858                       12,2265   70545 1  BADX      DLOAD   SR1          RECIPE EXCEEDED X BOUNDS - USE XMAX/2
0859   REF   7  LAST 1246   12,2266   00013 0                    XMAX
0860   REF  10  LAST 1246   12,2267   00025 0           STORE    X
0861                       12,2270   77650 1           GOTO
0862   REF   1              12,2271   24130 0                    DXCOMP


0863   REF   5  LAST 1246   12,2272   14015 0  BACKWARD  STODL   XMIN
0864   REF   3  LAST 1244   12,2273   11453 0                    KEPZERO
0865   REF   8  LAST 1247   12,2274   14013 0           STODL    XMAX
0866   REF   3  LAST 1244   12,2275   02306 0                    XKEPNEW
0867   REF  11  LAST 1247   12,2276   00025 0           STORE    X
0868                       12,2277   51054 1           BZE      BPL
0869   REF   1              12,2300   24305 1                    BADBKWDX
0870   REF   2  LAST 1247   12,2301   24305 1                    BADBKWDX
0871                       12,2302   51025 1           DSU      BPL
0872   REF   6  LAST 1247   12,2303   00015 0                    XMIN
0873   REF   2  LAST 1247   12,2304   24130 0                    DXCOMP
0874                       12,2305   70545 1  BADBKWDX  DLOAD   SR1
0875   REF   7  LAST 1247   12,2306   00015 0                    XMIN
0876   REF  12  LAST 1247   12,2307   00025 0           STORE    X
0877                       12,2310   77650 1           GOTO
0878   REF   3  LAST 1247   12,2311   24130 0                    DXCOMP


0879                       12,2312   50145 1  TIMEOVFL  DLOAD   BMN          X WAS TOO BIG
0880   REF  13  LAST 1247   12,2313   00025 0                    X
08805  REF   1              12,2314   24331 0                    NEGTOVFL
0881   REF   9  LAST 1247   12,2315   00013 0           STORE    XMAX
0882                       12,2316   70545 1  CMNTOVFL  DLOAD   SR1
0883   REF   5  LAST 1246   12,2317   02643 1                    DELX
0884   REF   6  LAST 1247   12,2320   02643 1           STORE    DELX
0885                       12,2321   44254 1           BZE      BDSU
08855  REF   1              12,2322   02270 0                    KEPRTN
0886   REF  14  LAST 1247   12,2323   00025 0                    X
0887   REF  15  LAST 1247   12,2324   14025 0           STODL    X
0888   REF   6  LAST 1246   12,2325   01551 1                    TC
0889   REF  12  LAST 1246   12,2326   00037 0           STORE    T
0890                       12,2327   77650 1           GOTO
0891   REF   1              12,2330   24252 1                    BRNCHCTR
08911  REF   8  LAST 1247   12,2331   00015 0  NEGTOVFL  STORE   XMIN
08912                      12,2332   77650 1           GOTO
08913  REF   1              12,2333   24316 0                    CMNTOVFL
0892                       12,2334   44545 0  KEPCONVG  DLOAD   SR4R
0893   REF   5  LAST 1243   12,2335   00041 1                    R1
0894                       12,2336   74225 1           DSU      VXSC
0895   REF   1              12,2337   00035 1                    XSQC(XI)
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0896  REF   3  LAST 1243  12,2340  02647 0                 URRECT
0897                      12,2341  65372 1        VSL1     PDDL      OD=(R1-XSQC(XI))URRECT (+33 OR +31)
0898  REF  16  LAST 1247  12,2342  00025 0                 X
0899                      12,2343  60316 0        DSQ      NORM
0900  REF  60  LAST 1245  12,2344  00047 1                 X1
0901                      12,2345  57275 0        DMPR     DMPR
0902  REF   3  LAST 1244  12,2346  00023 0                 1/ROOTMU
0903  REF  17  LAST 1248  12,2347  00025 0                 X
0904                      12,2350  53605 1        DMP      SRR*
0905  REF   1             12,2351  00033 1                 S(XI)
0906                      12,2352  21572 1                 0 -7,1
0907                      12,2353  77621 1        BDSU
0908  REF  13  LAST 1247  12,2354  00037 0                 T
0909                      12,2355  74352 0        SL1      VXSC
0910  REF   4  LAST 1243  12,2356  01511 0                 VRECT
0911                      12,2357  53372 1        VSL1     VAD                                   PL AT 0
0912                      12,2360  77712 0        VSL4
0913  REF  14  LAST 1226  12,2361  01535 0        STORE    RCV       RCV (+29 OR +27)


0914                      12,2362  60246 1        ABVAL    NORM
0915  REF  33  LAST 1245  12,2363  00050 1                 X2
0916  REF   2  LAST   93  12,2364  16655 0        STODL    RCNORM
0917  REF   2  LAST 1245  12,2365  00031 0                 XI
0918                      12,2366  45275 0        DMPR     DSU
0919  REF   2  LAST 1248  12,2367  00033 1                 S(XI)
0920  REF   1             12,2370  11473 1                 D1/128
0921                      12,2371  76405 1        DMP      SL1R
0922  REF   1             12,2372  00021 1                 ROOTMU
0923                      12,2373  53605 1        DMP      SLR*
0924  REF  18  LAST 1248  12,2374  00025 0                 X
0925                      12,2375  56601 0                 0 -3,2
0926                      12,2376  74271 0        DDV      VXSC
0927  REF   3  LAST 1248  12,2377  02655 0                 RCNORM
0928  REF   4  LAST 1248  12,2400  02647 0                 URRECT
0929                      12,2401  65372 1        VSL1     PDDL      OD=URRECT(XI S(XI)-1)X ROOTMU/RCV (+15
0930  REF   2  LAST 1247  12,2402  00035 1                 XSQC(XI)  OR +13)                      PL AT 6
0931                      12,2403  56257 1        SLR*     DDV
0932                      12,2404  56602 0                 0 -4,2
0933  REF   4  LAST 1248  12,2405  02655 0                 RCNORM
0934                      12,2406  74221 0        BDSU     VXSC
0935  REF   1             12,2407  11507 0                 D1/256
0936  REF   5  LAST 1248  12,2410  01511 0                 VRECT
0937                      12,2411  42455 0        VAD      VSL8                                  PL AT 0
0938                      12,2412  77626 0        STADR
0939  REF  13  LAST 1226  12,2413  62234 0        STODL    VCV       VCV (+7 OR +5)
0940  REF  14  LAST 1248  12,2414  00037 0                 T
0941                      12,2415  77615 0        DAD
0942  REF   5  LAST 1245  12,2416  01346 1                 TMODULO
0943  REF   7  LAST 1247  12,2417  15551 1        STODL    TC
```

```
0944   REF  19  LAST 1246   12,2420   00025 C            X
0945                        12,2421   77615 C      DAD
0946   REF   6  LAST 1245   12,2422   01344 0           XMODULO
0947   REF   2  LAST 1245   12,2423   01553 C      STORE XPREV
0948                        12,2424   77650 1      GOTO
0949   REF   2  LAST 1247   12,2425   02270 0           KEPRTN
```

```
0950                          12,2426   77776 1  DELTIME  EXIT                MPAC=XI (+6), OD=XSQ (+34 OR +32 -N1)
0951  REF   7  LAST 1157      12,2427  0 7171 1           TC      POLY
0952                          12,2430   00010 0           DEC     8
0953                          12,2431   02525 1           2DEC    .083333334
0953                          12,2432   12526 0
0954                          12,2433   67356 0           2DEC    -.266666684
0954                          12,2434   75666 0
0955                          12,2435   15001 1           2DEC    .406349155
0955                          12,2436   23771 1
0956                          12,2437   64342 0           2DEC    -.361198675
0956                          12,2440   43674 0
0957                          12,2441   06563 1           2DEC    .210153242
0957                          12,2442   04645 1
0958                          12,2443   75173 0           2DEC    -.086221951
0958                          12,2444   52672 0
0959                          12,2445   00656 1           2DEC    .026268812
0959                          12,2446   14331 0
0960                          12,2447   77633 1           2DEC    -.006163316
0960                          12,2450   40512 0
0961                          12,2451   00023 0           2DEC    .001177342
0961                          12,2452   11210 1
0962                          12,2453   77774 0           2DEC    -.000199055
0962                          12,2454   67506 0
0963  REF 231  LAST 1225      12,2455  0 6006 1           TC      INTPRET
0964  REF   3  LAST 124E      12,2456   14033 1           STODL   S(XI)
0965  REF   3  LAST 124E      12,2457   00031 0                   XI
0966                          12,2460   77776 1           EXIT
0967  REF   8  LAST 125C      12,2461  0 7171 1           TC      POLY
0968                          12,2462   00010 0           DEC     8
0969                          12,2463   01000 0           2DEC    .031250001
0969                          12,2464   00000 1
0970                          12,2465   72525 0           2DEC    -.166666719
0970                          12,2466   52506 0
0971                          12,2467   13301 1           2DEC    .355555413
0971                          12,2470   15337 1
0972                          12,2471   62776 0           2DEC    -.406347410
0972                          12,2472   54733 1
0973                          12,2473   11176 1           2DEC    .288962094
0973                          12,2474   13267 0
0974                          12,2475   73410 0           2DEC    -.140117894
0974                          12,2476   51674 0
0975                          12,2477   01446 0           2DEC    .049247387
0975                          12,2500   33641 1
0976                          12,2501   77451 1           2DEC    -.013081923
0976                          12,2502   65233 0
0977                          12,2503   00055 1           2DEC    .002806389
0977                          12,2504   37266 1
0978                          12,2505   77767 1           2DEC    -.000529414
0978                          12,2506   52336 0
0979  REF 232  LAST 125C      12,2507  0 6006 1           TC      INTPRET
```

```
0980                        12,2510  53605 1    DMP     SRR*                                    PL AT 0
0981                        12,2511  00001 0               OD
0982                        12,2512  21574 1               0 -5,1
0983  REF   3  LAST 1248   12,2513  00035 1    STORE   XSQC(XI)     XSQC(XI) (+33 OR +31)
0984                        12,2514  72405 0    DMP     SL1
0985  REF   2  LAST 1243   12,2515  00043 0               KEPC1
0986                        12,2516  65234 1    RTB     PDDL        XCH WITH PL. OD=C1 XSQ C(XI) (+49 OR +46
0987  REF   9  LAST 1220   12,2517  45562 1               TPMODE                                  PL AT 0,3
0988                        12,2520  53605 1    DMP     SRR*
0989  REF   4  LAST 1250   12,2521  00033 1               S(XI)
0990                        12,2522  21574 1               0 -5,1
0991                        12,2523  72405 0    DMP     SL1
0992  REF   2  LAST 1243   12,2524  00045 0               KEPC2
0993                        12,2525  65234 1    RTB     PDDL        30=C2 XSQ S(XI) (+35 OR +33)  PL AT 6
0994  REF  10  LAST 1251   12,2526  45562 1               TPMODE
0995  REF   6  LAST 1247   12,2527  00041 1               R1
0996                        12,2530  76261 0    SR      TAD                                     PL AT 3
0997                        12,2531  20607 1               6
0998                        12,2532  41301 0    NORM    DMP         TO PRESERVE SIGNIF.
0999  REF  61  LAST 1248   12,2533  00047 1               X1
1000  REF  20  LAST 1249   12,2534  00025 0               X
1001                        12,2535  76257 0    SR*     TAD         X(C2 XSQ S(XI) +R1) (+49 OR +46) PL AT 0
1002                        12,2536  20576 1               0 -3,1
1003                        12,2537  57232 0    SL4R    DMPR
1004  REF   4  LAST 1248   12,2540  00023 0               1/RCCTMU
1005  REF  15  LAST 1248   12,2541  00037 0          STORE  T
1006                        12,2542  77616 0          RVQ
```

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1007                        12,2543  71214 C  ITERATOR BONCLR DLOAD
1008  REF   1               12,2544  00614 1                SLOPESW
1009  REF   1               12,2545  24613 C                FIRSTIME
1010  REF   1               12,2546  00037 C                DEP
1011                        12,2547  60225 1          DSU   NORM
1012  REF   2  LAST   93    12,2550  02764 C                DEPREV
1013  REF  62  LAST 1251    12,2551  00047 1                X1
1014                        12,2552  60325 C          PDDL  NORM
1015  REF   1               12,2553  00015 C                DELINDEP
1016  REF  34  LAST 1248    12,2554  00050 1                X2
1017                        12,2555  41260 C          XSU,1 DMP
1018  REF  35  LAST 1252    12,2556  00047 1                X2
1019  REF   3  LAST   93    12,2557  02762 C                DELDEP
1020                        12,2560  56257 1          SLR*  DDV                          PL UP 2
1021                        12,2561  21202 1                1,1
1022                        12,2562  43142 1          SR1   BOFF
1023  REF   1               12,2563  04351 1                ORDERSW
1024  REF   1               12,2564  24567 C                SGNCHECK
1025                        12,2565  75246 C          ABS   SIGN      IN CASE 2ND DERIV. CHANGED SIGN, MUST
1026  REF   4  LAST 1252    12,2566  02762 C                DELDEP    DISREGARD IT TO FIND MIN.

1027                        12,2567  51006 C  SGNCHECK PUSH  BPL     TRIAL DELINDEP           PL DOWN 2
1028  REF   1               12,2570  24625 C                POSDEL
1029                        12,2571  43145 C          DLOAD BON
1030  REF   1               12,2572  03775 1                INDEP
1031  REF   2  LAST 1252    12,2573  04311 C                ORDERSW
1032  REF   1               12,2574  24576 C                MINCHECK
1033  REF   1               12,2575  00017 1          STORE MAX       IF NOT 2ND ORDER, CAN MOVE MAX BOUND IN.

1034                        12,2576  45221 1  MINCHECK BDSU  DSU
1035  REF   1               12,2577  00011 1                MIN
1036                        12,2600  51000 C          BOV   BPL
1037  REF   1               12,2601  24605 1                MODNGDEL
1038  REF   2  LAST 1252    12,2602  24605 1                MODNGDEL
1039                        12,2603  77650 1          GOTO
1040  REF   1               12,2604  24637 C                DELOK

1041                        12,2605  45345 1  MODNGDEL DLOAD  DSU     TRIAL DELINDEP WOULD EXCEED MIN BOUND
1042  REF   2  LAST 1252    12,2606  00011 1                MIN
1043  REF   2  LAST 1252    12,2607  03775 1                INDEP
1044                        12,2610  52005 C          DMP   GOTO
1045  REF   3  LAST 1246    12,2611  11511 1                DP9/10
1046  REF   1               12,2612  24641 1                NEWDEL

1047                        12,2613  41345 C  FIRSTIME DLOAD  DMP
1048  REF   3  LAST 1252    12,2614  00011 1                MIN
1049  REF   1               12,2615  00051 C                TWEEKIT   DLOAD TWEEKIT(400) SENSITIVE TO CHANGE.
1050                        12,2616  41325 C          PDDL  DMP       S2(410) SHOULDNT CONTAIN HI ORDER ONES
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1051  REF   2  LAST 1252   12,2617   00017 1                    MAX
1052  REF   2  LAST 1252   12,2620   00051 0                    TWEEKIT
1053                        12,2621   77625 0          DSU
1054                        12,2622   52165 1          SIGN      GOTO
1055  REF   5  LAST 1252   12,2623   02762 0                    DELDEP
1056  REF   2  LAST 1252   12,2624   24567 0                    SGNCHECK


1057                        12,2625   43145 0  POSDEL  DLOAD     BON
1058  REF   3  LAST 1252   12,2626   03775 1                    INDEP
1059  REF   3  LAST 1252   12,2627   04311 0                    ORDERSW
1060  REF   1               12,2630   24632 0                    MAXCHECK
1061  REF   4  LAST 1252   12,2631   00011 1          STORE     MIN          IF NOT 2ND ORDER, CAN MOVE MIN BOUND IN.

1062                        12,2632   45221 1  MAXCHECK BDSU     DSU
1063  REF   3  LAST 1253   12,2633   00017 1                    MAX
1064                        12,2634   50000 1          BOV       BMN
1065  REF   1               12,2635   24643 0                    MODPSDEL
1066  REF   2  LAST 1253   12,2636   24643 0                    MODPSDEL
1067                        12,2637   77745 1  DELOK   DLOAD
1068                        12,2640   00001 0                    OD
1069  REF   2  LAST 1252   12,2641   00015 0  NEWDEL  STORE     DELINDEP
1070                        12,2642   77616 0          RVQ


1071                        12,2643   45345 1  MODPSDEL DLOAD    DSU
1072  REF   4  LAST 1253   12,2644   00017 1                    MAX
1073  REF   4  LAST 1253   12,2645   03775 1                    INDEP
1074                        12,2646   52005 0          DMP       GOTO
1075  REF   4  LAST 1252   12,2647   11511 1                    DP9/10
1076  REF   2  LAST 1252   12,2650   24641 1                    NEWDEL


1077  REF 153  LAST 1197   12,2651  4 4712 0  CHECKCTR CS       ONE
1078  REF  36  LAST 1180   12,2652   50 120 1           INDEX     FIXLOC
1079  REF   2  LAST 1243   12,2653   6 0026 0           AD        ITERCTR
1080  REF  37  LAST 1253   12,2654   50 120 1           INDEX     FIXLOC
1081  REF   3  LAST 1253   12,2655   54 026 1           TS        ITERCTR
1082  REF 651  LAST 1221   12,2656   54 154 0           TS        MPAC
1083  REF  62  LAST 1166   12,2657   0 6030 1           TC        DANZIG
```

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1084                        12,2660  44545 0  NEWSTATE DLOAD  SR4R
1085  REF  7  LAST 1251     12,2661  00041 1                  R1
1089                        12,2662  74225 1           DSU    VXSC
1090  REF  4  LAST 1251     12,2663  00035 1                  XSQC(X1)
1091  REF  3  LAST 1243     12,2664  02724 1                  UR1
1092                        12,2665  65372 1           VSL1   PDDL     DD=(R1-XSQC(X1))UR1 (+33 OR 31) PL AT 6
1093  REF 21  LAST 1251     12,2666  00025 0                  X
1094                        12,2667  60316 0           DSQ    NORM
1095  REF 63  LAST 1252     12,2670  00047 1                  X1
1096                        12,2671  57275 0           DMPR   DMPR
1097  REF  5  LAST 1251     12,2672  00023 0                  1/ROOTMU
1098  REF 22  LAST 1254     12,2673  00025 0                  X
1099                        12,2674  53605 1           DMP    SRR*
1100  REF  5  LAST 1251     12,2675  00033 1                  S(X1)
1101                        12,2676  21572 1                  0 -7,1
1102                        12,2677  77621 1           BDSU
1103  REF 16  LAST 1251     12,2700  00037 0                  T
1104                        12,2701  74352 0           SL1    VXSC
1105  REF 15  LAST  89C     12,2702  02746 0                  VVEC
1106                        12,2703  53372 1           VSL1   VAD                                  PL AT 0
1107                        12,2704  41512 1           VSL4   PUSH
1108                        12,2705  77646 0           ABVAL
1109                        12,2706  77701 1  LAMENTER NORM
1110  REF 64  LAST 1254     12,2707  00047 1                  X1
1111  REF  1                12,2710  16722 1           STODL  R2
1112  REF  4  LAST 125C     12,2711  00031 0                  X1
1113                        12,2712  45205 1           DMP    DSU
1114  REF  6  LAST 1254     12,2713  00033 1                  S(X1)
1115  REF  2  LAST 1248     12,2714  11473 1                  D1/128
1116                        12,2715  76405 1           DMP    SL1R
1117  REF  2  LAST 1248     12,2716  00021 1                  ROOTMU
1118                        12,2717  53605 1           DMP    SLR*
1119  REF 23  LAST 1254     12,2720  00025 0                  X
1120                        12,2721  21176 1                  0 -3,1
1121                        12,2722  74271 0           DDV    VXSC
1122  REF  2  LAST 1254     12,2723  02722 1                  R2
1123  REF  4  LAST 1254     12,2724  02724 1                  UR1
1124                        12,2725  65372 1           VSL1   PDDL     6D=V2VEC PART (+15 OR 13)       PL AT 12
1125  REF  5  LAST 1254     12,2726  00035 1                  XSQC(X1)
1126                        12,2727  56257 1           SLR*   DDV
1127                        12,2730  21175 1                  0 -4,1
1128  REF  3  LAST 1254     12,2731  02722 1                  R2
1129                        12,2732  77621 1           BDSU
1130  REF  2  LAST 1248     12,2733  11507 0                  D1/256
1131                        12,2734  53361 0           VXSC   VAD                                  PL AT 6
1132  REF 16  LAST 1254     12,2735  02746 0                  VVEC
1133                        12,2736  43412 1           VSL8   RVQ
R1134
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```
 1135  REF  1                 04,2000                    SETLOC CONICS1
 1136                         04,3467                    BANK

 1137  REF  1                                            COUNT  04/CONIC
R1138  DO NOT DISTURB THE ORDER OF THESE CDS, OVERLAYS HAVE BEEN MADE.
 1139                         04,3467   00000 1  BEE17   DEC    0              KEEP WITH D1/8 2DEC 1.0B-17 (0000004000)
 1140                         04,3470   04000 0  D1/8     2DEC   1.0 B-3
 1140                         04,3471   00000 1
 1141                         04,3472   00200 0  D1/128   2DEC   1.0 B-7
 1141                         04,3473   00000 1
 1142                         04,3474   00400 0  D1/64    2DEC   1.0 B-6
 1142                         04,3475   00000 1
 1143                         04,3476   10000 0  D1/4     2DEC   1.0 B-2
 1143                         04,3477   00000 1
 1144                         04,3500   02000 0  D1/16    2DEC   1.0 B-4
 1144                         04,3501   00000 1
 1145                         04,3502   01000 0  D1/32    2DEC   1.0 B-5
 1145                         04,3503   00000 1
 1146                         04,3504   00020 0  D1/1024  2DEC   1.0 B-10
 1146                         04,3505   00000 1
 1147                         04,3506   00100 0  D1/256   2DEC   1.0 B-8
 1147                         04,3507   00000 1
 1148                         04,3510   34631 1  DP9/10   2DEC   .9
 1148                         04,3511   23146 0
 1149  REF  5 LAST  678       04,3452              KEPZERO  EQUALS LO6ZEROS
 1150                         04,3512   77467 1  -50SC    2DEC   -50.0 B-12
 1150                         04,3513   77777 0
 1151                         04,3514   03110 1  2PISC    2DEC   6.28318530 B-6
 1151                         04,3515   17665 1
 1152  REF  2 LAST  547       04,3501              BEE19    EQUALS D1/32 -1        2DEC 1.0 B-19 (00000 01000)
 1153  REF  3 LAST 1254       04,3505              BEE22    EQUALS D1/256 -1       2DEC 1.0 B-22 (00000 00100)
 1154                         04,3516   00000 1  ONEBIT   2DEC   1.0 B-28
 1154                         04,3517   00001 0
 1155                         04,3520   37767 0  COGUPLIM 2DEC   .999511597
 1155                         04,3521   37737 0
 1156                         04,3522   40010 1  COGLOLIM 2DEC   -.999511597
 1156                         04,3523   40040 1
R1157
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L CONIC SUBROUTINES

```
1158  REF  2 LAST 1242   12,2000                    SETLOC CONICS
1159                     12,2737                    BANK

1160  REF  2 LAST 1243 TO 1255:  479   479*         COUNT  12/CONIC

1161                     12,2737  40220 C  TIMETHET STQ    SETPD                              PL AT 0
1162  REF  1             12,2740  02712 1                  RTNTT
1163                     12,2741  00001 C                  0
1164                     12,2742  63375 C          VLOAD   PDVL      SETUP FOR PARAM CALL     PL AT 6
1165  REF 11 LAST  89C   12,2743  02657 1                  RVEC
1166  REF 17 LAST 1254   12,2744  02746 C                  VVEC
1167                     12,2745  77624 1          CALL
1168  REF  2 LAST  85E   12,2746  11524 1                  PARAM
1169                     12,2747  45000 C          BOV     CALL                               PL AT 0
1170  REF  1             12,2750  24767 1                  COGACVFL
1171  REF  1             12,2751  24772 C                  GETX
1172                     12,2752  43145 C  COMMNOUT DLOAD  BON
1173  REF  5 LAST 1254   12,2753  00031 C                  XI
1174  REF  2 LAST  89C   12,2754  04310 1                  INFINFLG
1175  REF  2 LAST 125E   12,2755  02712 1                  RTNTT
1176                     12,2756  45014 C          CLEAR   CALL
1177  REF  2 LAST  89C   12,2757  04273 C                  COGAFLAG
1178  REF  2 LAST 1249   12,2760  24426 1                  DELTIME
1179                     12,2761  45014 C          BON     CALL
1180  REF  6 LAST  89C   12,2762  03706 C                  RVSW
1181  REF  3 LAST 125E   12,2763  02712 1                  RTNTT
1182  REF  1             12,2764  24660 1                  NEWSTATE
1183                     12,2765  77650 1          GOTO
1184  REF  4 LAST 125E   12,2766  02712 1                  RTNTT

1185                     12,2767  77614 1  COGAOVFL SETGO
1186  REF  3 LAST 125E   12,2770  04033 C                  COGAFLAG
1187  REF  5 LAST 125E   12,2771  02712 1                  RTNTT
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L CONIC SUBROUTINES USER'S PAGE NO. 30 E5 S3

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11872                          04,3524                  BANK   4
11874  REF   2 LAST 1255       04,2000                  SETLOC CONICS1
11876                          04,3524                  BANK
11878  REF   2 LAST 1255 TO 1256:   29    29*           COUNT* $$/CONIC
1188                           04,3524  43020 1 PARAM    STQ    CLEAR        MPAC=VIVEC, OD=RIVEC          PL AT 6
1189   REF   2 LAST   93       04,3525  02755 1                 RTNPRM
1190   REF   7 LAST  847       04,3526  03665 1                 NORMSW
11901                          04,3527  77614 1          CLEAR
11902  REF   4 LAST 1256       04,3530  04273 0                 COGAFLAG
1191                           04,3531  45131 0          SSP    CALL
1192   REF   3 LAST  479       04,3532  02675 1                 GEOMSGN
1193                           04,3533  27777 0                 37777        GAMMA ALWAYS LESS THAN 180DEG
1194   REF   1                 04,3534  11570 0                 GEOM         MPAC=SNGA (+1), OD=CSGA (+1) PL AT 2
1195                           04,3535  14045 0          STODL  36D          36D=SIN GAMMA (+1)            PL AT 0
1196                           04,3536  56261 1          SR     DDV
1197                           04,3537  20606 0                 5

1198                           04,3540  00045 0                 36D
1199   REF   4 LAST  858       04,3541  33775 1          STOVL* COGA
1200   REF   6 LAST 1243       04,3542  11626 0                 MUTABLE,1
1201   REF   2 LAST 1243       04,3543  14017 1          STODL  1/MU
1202   REF   3 LAST   93       04,3544  02722 1                 MAGVEC2
1203                           04,3545  60316 0          DSQ    NORM
1204   REF  65 LAST 1254       04,3546  00047 1                 X1
1205                           04,3547  41275 1          DMPR   DMP
1206   REF   3 LAST 1257       04,3550  00017 1                 1/MU
1207   REF   8 LAST 1254       04,3551  00041 1                 R1
1208                           04,3552  77657 0          SRR*
1209                           04,3553  21576 0                 0 -3,1
1210                           04,3554  44206 0          PUSH   BDSU         OD=R1 VISQ/MU (+6)            PL AT 2
1211   REF   3 LAST 1255       04,3555  11503 1                 D1/32
1212   REF   3 LAST  858       04,3556  16744 1          STODL  R1A          R1A (+6)                      PL AT 0

1213                           04,3557  60205 0          DMP    NORM
1214                           04,3560  00045 0                 36D
1215   REF  66 LAST 1257       04,3561  00047 1                 X1
1216                           04,3562  53605 1          DMP    SR*
1217                           04,3563  00045 0                 36D
1218                           04,3564  20575 1                 0 -4,1
1219   REF   3 LAST  858       04,3565  02742 1          STORE  P            P (+4)
1220                           04,3566  77650 1          GOTO
1221   REF   3 LAST 1257       04,3567  02755 1                 RTNPRM
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1225                          04,3570  77656 1  GEOM     UNIT                MPAC=V2VEC, OD=R1VEC          PL AT 6
1226  REF  2  LAST   93       04,3571  16714 1           STODL    U2         U2 (+1)
1227                          04,3572  00045 0                    36D
1228  REF  4  LAST 1257       04,3573  26722 1           STOVL    MAGVEC2                                  PL AT 0
1229                          04,3574  77656 1           UNIT
1230  REF  5  LAST 1254       04,3575  02724 1           STORE    UR1        UR1 (+1)
1231                          04,3576  72441 0           DOT      SL1
1232  REF  3  LAST 1258       04,3577  02714 1                    U2
1233                          04,3600  77725 1           PDDL                OD=CSTH (+1)                  PL AT 2
1234                          04,3601  00045 0                    36D
1235  REF  9  LAST 1257       04,3602  24041 1           STOVL    R1         R1 (+29 OR +27)
1236  REF  6  LAST 1258       04,3603  02724 1                    UR1
1237                          04,3604  76435 1           VXV      VSL1
1238  REF  4  LAST 1258       04,3605  02714 1                    U2
1239                          04,3606  75214 1           BON      SIGN
1240  REF  8  LAST 1257       04,3607  03705 0                    NORMSW
1241  REF  1                  04,3610  11622 1                    HAVENORM
1242  REF  4  LAST 1257       04,3611  02675 1                    GEOMSGN
1243                          04,3612  40056 0           UNIT     BOV
1244  REF  1                  04,3613  11620 0                    COLINEAR
1245  REF  4  LAST  478       04,3614  16676 1  UNITNORM STODL    UN         UN (+1)
1246                          04,3615  00045 0                    36D
1247                          04,3616  43565 0           SIGN     RVQ        MPAC=SNTH (+1), 34D=SNTH.SNTH (+2)
1248  REF  5  LAST 1258       04,3617  02675 1                    GEOMSGN

1249                          04,3620  52162 0  COLINEAR VSR1     GOTO
1250  REF  1                  04,3621  11614 1                    UNITNORM

1251                          04,3622  75246 0  HAVENORM ABVAL    SIGN
1252  REF  6  LAST 1258       04,3623  02675 1                    GEOMSGN
1253                          04,3624  77616 0           RVQ                 MPAC=SNTH (+1), 34D=SNTH.SNTH (+2)
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1254                        12,2772                 BANK    12
1255  REF   3  LAST 1256   12,2000                 SETLOC  CONICS
1256                        12,2772                 BANK

12565 REF   3 LAST 1256 TO 1257:    27   506*      COUNT   12/CONIC

1257                        12,2772  66374 1 GETX   AXT,2   SSP       ASSUMES P (+4) IN MPAC
1258                        12,2773  00003 1        3
1259  REF  26  LAST 1224   12,2774  00052 0        S2
1260                        12,2775  00001 0        1
1261                        12,2776  77614 1        CLEAR
1262  REF   1               12,2777  04276 0        360SW
1263                        12,3000  65366 1 SQRT   PDDL      OD=SQRT(P)                    PL AT 2
1264  REF   9  LAST  889    12,3001  02734 0        CSTH
1265                        12,3002  44342 1 SR1    BDSU
1266  REF   2  LAST   31    12,3003  11477 0        D1/4
1267                        12,3004  54325 1 PDDL   SRR                                    PL AT 4D
1268  REF  11  LAST  89C    12,3005  02732 0        SNTH
1269                        12,3006  21607 0        6
1270                        12,3007  77671 1 DDV                                           PL AT 2
1271                        12,3010  77600 1 BDV
1272  REF   1               12,3011  25125 0        360CHECK
1273                        12,3012  41225 1 DSU    DMP
1274  REF   5  LAST 1257    12,3013  03775 1        COGA                                  PL AT 0
1275                        12,3014  40132 0        SL2R    BDV
1276  REF   2  LAST 1259    12,3015  25125 0        360CHECK
1277                        12,3016  63406 0 WLOOP  PUSH    DSQ       OD=W (+5)                   PL AT 2
1278                        12,3017  65351 0        TLOAD   PDDL      2D=WSQ (+10)                PL AT 5
1279  REF 652  LAST 1253    12,3020  00155 0        MPAC
1280  REF   4  LAST 1257    12,3021  02744 1        R1A
1281                        12,3022  76202 0        SR4     TAD                           PL AT 2
1282                        12,3023  75440 0        BMN     SQRT
1283  REF   1               12,3024  25210 0        INFINITY
1284                        12,3025  43306 0 ROUND  DAD                                   PL AT OD
1285                        12,3026  61000 0        BOV     TIX,2
1286  REF   1               12,3027  25123 0        RESETX2
1287  REF   1               12,3030  25016 1        WLOOP


1288                        12,3031  40065 0        BDDV    BDV
1289  REF   3  LAST 1254    12,3032  11473 1        D1/128
1290  REF   2  LAST 1259    12,3033  25210 0        INFINITY
1291                        12,3034  41440 1 POLYCOEF BMN    PUSH      OD=1/W (+2) OR 16/W (+6)    PL AT 2
1292  REF   3  LAST 1259    12,3035  25210 0        INFINITY
1293                        12,3036  77716 1        DSQ
1294                        12,3037  41301 0        NORM    DMP
1295  REF  67  LAST 1257    12,3040  00047 1        X1
1296  REF   5  LAST 1259    12,3041  02744 1        R1A
1297                        12,3042  77457 1 SRR*   EXIT
1298                        12,3043  21567 0        0 -10D,1
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1299  REF   9 LAST 1250   12,3044  0 7171 1          TC      POLY
1300                      12,3045   00005 1          DEC     5
1301                      12,3046   20000 0          2DEC    .5
1301                      12,3047   00000 1
1302                      12,3050   72525 0          2DEC    -.166666770
1302                      12,3051   52471 1
1303                      12,3052   03146 1          2DEC    .100000392
1303                      12,3053   15003 0
1304                      12,3054   75556 0          2DEC    -.071401086
1304                      12,3055   45210 0
1305                      12,3056   01615 1          2DEC    .055503292
1305                      12,3057   13553 0
1306                      12,3060   76371 0          2DEC    -.047264098
1306                      12,3061   63777 0
1307                      12,3062   01232 0          2DEC    .040694204
1307                      12,3063   27367 0
1308  REF 233 LAST 1250   12,3064  0 6006 1          TC      INTPRET
1309                      12,3065   76405 1          DMP     SL1R                    PL AT OD
1310                      12,3066   43006 0          PUSH    BDN
1311  REF   2 LAST 1259   12,3067   04316 1                  360SW
1312  REF   1             12,3070   25175 0                  TRUE360X
1313                      12,3071   60316 0 XCOMMON  DSQ     NORM
1314  REF  68 LAST 1259   12,3072   00047 1                  X1
1315                      12,3073   53605 1          DMP     SRR*
1316  REF   6 LAST 1259   12,3074   02744 1                  R1A
1317                      12,3075   21565 1                  0 -120,1
1318  REF   6 LAST 1256   12,3076   14031 0          STODL   XI              XI (+6)


1319  REF  10 LAST 1258   12,3077   00041 1                  R1
1320                      12,3100   75542 0          SR1     SQRT
1321                      12,3101   41306 1          ROUND   DMP
1322                      12,3102   77632 0          SL4R                            PL AT 0
1323  REF  24 LAST 1254   12,3103   00025 0          STORE   X               X (+17 OR +16)


1324                      12,3104   60316 0          DSQ     NORM
1325  REF  69 LAST 1260   12,3105   00047 1                  X1
1326                      12,3106   41325 0          PDDL    DMP             OD=XSQ (+34 OR +32 -N1)     PL AT 2
1327  REF   4 LAST 1257   12,3107   02742 1                  P
1328  REF  11 LAST 1260   12,3110   00041 1                  R1
1329                      12,3111   75452 0          SL3     SQRT
1330                      12,3112   56405 0          DMP     SL3R
1331  REF   6 LAST 1259   12,3113   03775 1                  COGA
1332  REF   3 LAST 1251   12,3114   14043 0          STODL   KEPC1
1333  REF   7 LAST 1260   12,3115   02744 1                  R1A
1334                      12,3116   43021 0          BDSU    CLEAR
1335  REF   3 LAST 1243   12,3117   11475 1                  D1/64
1336  REF   3 LAST 1256   12,3120   04270 0                  INFINFLG
1337  REF   3 LAST 1251   12,3121   00045 0          STORE   KEPC2
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1338                        12,3122  77616 0          RVQ

1339                        12,3123  77774 0  RESETX2 AXT,2
1340                        12,3124  00003 1                  3

1341                        12,3125  51001 1  360CHECK SETPD  BPL
1342                        12,3126  00001 0                  OD
1343  REF  1                12,3127  25132 0                  INVRSEQN
1344                        12,3130  77614 1          SET
1345  REF  3  LAST 126C     12,3131  04076 1                  360SW

1346                        12,3132  75545 1  INVRSEQN DLOAD  SQRT
1347  REF  5  LAST 126C     12,3133  02742 1                  P
1348                        12,3134  41325 0          PDDL    DMP             OD=SQRT(P)  (+2)                PL AT 2
1349  REF 12  LAST 1259     12,3135  02732 0                  SNTH
1350  REF  7  LAST 126C     12,3136  03775 1                  COSA
1351                        12,3137  65352 0          SL1     PDDL            2D=SNTH COSA (+5)               PL AT 4
1352  REF 10  LAST 1259     12,3140  02734 0                  CSTH
1353                        12,3141  43202 0          SR4     DAD
1354  REF  4  LAST 1257     12,3142  11503 1                  D1/32
1355                        12,3143  41225 1          DSU     DMP                                             PL AT 2,0
1356                        12,3144  55301 0          NORM    BDDV
1357  REF  7C LAST 126C     12,3145  00047 1                  X1
1358  REF  13 LAST 1261     12,3146  02732 0                  SNTH
1359                        12,3147  51457 0          SLR*    ABS             NOTE: NEAR 360 CASE TREATED DIFFERENTLY
1360                        12,3150  21174 0                  0 -5,1
1361                        12,3151  63406 0          PUSH    DSQ             OD=1/W (-1)                     PL AT 2
1362                        12,3152  14043 0          STODL   34D
1363  REF  1                12,3153  11501 0                  D1/16
1364                        12,3154  63406 0  1/WLOOP PUSH    DSQ             2D=G (+4)                       PL AT 4
1365                        12,3155  65234 1          RTB     PDDL                                            PL AT 7
1366  REF 11  LAST 1251     12,3156  45562 1                  TPMODE
1367  REF  8  LAST 126C     12,3157  02744 1                  R1A
1368                        12,3160  40405 1          DMP     SR4
1369                        12,3161  00043 0                  34D
1370                        12,3162  77771 0          TAD                                                     PL AT 4
1371                        12,3163  75440 0          BMN     SQRT
1372  REF  4  LAST 1259     12,3164  25210 0                  INFINITY
1373                        12,3165  77615 0          DAD                                                     PL AT 2
1374                        12,3166  60304 0          TIX,2   NORM
1375  REF  1                12,3167  25154 0                  1/WLOOP
1376  REF 11  LAST 1261     12,3170  00047 1                  X1
1377                        12,3171  77665 1          BDDV                                                    PL AT 0
1378                        12,3172  52057 1          SLR*    GOTO
1379                        12,3173  21172 0                  0 -7,1
1380  REF  1                12,3174  25034 1                  POLYCOEF
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L CONIC SUBROUTINES

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1381                          12,3175  50145 1  TRUE360X DLOAD   BMN
1382  REF   9  LAST 1261     12,3176  02744 1                   R1A
1383  REF   5  LAST 1261     12,3177  25210 0                   INFINITY
1384                          12,3200  60366 1            SQRT   NORM
1385  REF  72  LAST 1261     12,3201  00047 1                   X1
1386                          12,3202  53665 1            BDDV   SL*
1387  REF   3  LAST 1244     12,3203  11515 0                   2PISC
1388                          12,3204  20176 0                   0 -3,1
1389                          12,3205  41425 1            DSU    PUSH      OD=2PI/SQRT(R1A) -X          PL AT 0,2
1390                          12,3206  77650 1            GOTO
1391  REF   1                 12,3207  25071 0                   XCOMMON
1392                          12,3210  40001 1  INFINITY SETPD   BOV       NO SOLUTION EXISTS SINCE CLOSURE THROUGH
1393                          12,3211  00001 0                   0         INFINITY IS REQUIRED
1394  REF   1                 12,3212  25213 0                   OVFLCLR
1395                          12,3213  43414 1  OVFLCLR  SET    RVQ
1396  REF   4  LAST 126C     12,3214  04070 1                   INFINFLG
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1397                          12,3215  40220 C  LAMBERT  STQ     SETPD
1398  REF   5  LAST   93      12,3216  02712 1           RTNLAMB
1399                          12,3217  00001 0           OD
1400                          12,3220  76731 C  SSP     VLOAD*
1401  REF   4  LAST 1253      12,3221  00027 1           ITERCTR
1402                          12,3222  00024 1           20D
1403  REF   7  LAST 1257      12,3223  11626 C           MUTABLE,1
1404  REF   4  LAST 1257      12,3224  14017 1  STODL    1/MU
1405  REF   3  LAST  478      12,3225  02673 1           TDESIRED
1406                          12,3226  77675 0  DMPR
1407  REF   1                 12,3227  11502 C           BEE19
1408  REF   1                 12,3230  03777 0  STORE    EPSILONL
1409                          12,3231  77214 C  SET      VLOAD
1410  REF   2  LAST 1252      12,3232  00474 C           SLOPESW
1411  REF   6  LAST  479      12,3233  02657 1           R1VEC
1412                          12,3234  45115 C  PDVL     CALL
1413  REF  10  LAST  480      12,3235  02665 C           R2VEC
1414  REF   2  LAST 1257      12,3236  11570 C           GEOM
1415  REF  14  LAST 1261      12,3237  16732 C  STODL    SNTH
1416  REF   5  LAST 1258      12,3240  02722 1           MAGVEC2
1417                          12,3241  65301 C  NORM     PDDL
1418  REF  73  LAST 1262      12,3242  00047 1           X1
1419  REF  12  LAST 126C      12,3243  00041 1           R1
1420                          12,3244  56342 1  SR1      DDV
1421                          12,3245  65257 1  SL*      PDDL
1422                          12,3246  20173 C           0 -6,1
1423                          12,3247  77626 C  STADR
1424  REF  11  LAST 1261      12,3250  75043 1  STORE    CSTH
1425                          12,3251  44342 1  SR1      BDSU
1426  REF   3  LAST 1259      12,3252  11477 0           D1/4
1427  REF   2  LAST   93      12,3253  02736 1  STORE    1-CSTH

1428                          12,3254  53106 C  ROUND    BZE
1429  REF   1                 12,3255  25465 1           360LAMB
1430                          12,3256  65301 0  NORM     PDDL
1431  REF  74  LAST 1263      12,3257  00047 1           X1
1432                          12,3260  00001 0           OD
1433                          12,3261  56342 1  SR1      DDV
1434                          12,3262  75457 C  SL*      SQRT
1435                          12,3263  20176 C           0 -3,1
1436                          12,3264  54325 1  PDDL     SR
1437  REF  15  LAST 1263      12,3265  02732 C           SNTH
1438                          12,3266  20607 1           6
1439                          12,3267  43271 1  DDV      DAD
1440  REF   3  LAST 1263      12,3270  02736 1           1-CSTH
14401                         12,3271  77626 C  STADR
14402 REF   1                 12,3272  77760 C  STORE    COGAMAX
1441                          12,3273  50000 1  BOV      BMN
1442  REF   1                 12,3274  25301 1           UPLIM
14421 REF   1                 12,3275  25304 1           MAXCOGA
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                                                  OD=R1VEC (+29 OR +27)          PL AT 6
                                                  MPAC=R2VEC (+29 OR +27)
                                                  OD=CSTH (+1)                   PL AT 2
                                                                                 PL AT 4
                                                  DXCH WITH OD, OD=R1/R2 (+7)    PL AT 0,2
                                                  CSTH (+1)
                                                  1-CSTH (+2)

                                                                                 PL AT 4
                                                                                 PL AT 2
                                                  2D=SQRT(2R1/R2(1-CSTH)) (+5)   PL AT 4
                                                                                 PL AT 2
                                                  IF OVFL, COGAMAX=COGUPLIM
                                                  IF NEG, USE EVEN IF LT COGLOLIM, SINCE
                                                    THIS WOULD BE RESET IN LAMBLOOP
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14422                          12,3276  50025 0          DSU     BMN       IF COGAMAX GT COGUPLIM, COGAMAX=COGUPLIM
14423  REF   1                 12,3277  11521 1                  COGUPLIM
14424  REF   2  LAST 1263      12,3300  25304 1                  MAXCOGA   OTHERWISE OK, SO GO TO MAXCOGA
14425                          12,3301  77745 1  UPLIM   DLOAD
14426  REF   2  LAST 1264      12,3302  11521 1                  COGUPLIM  COGUPLIM=.999511597 = MAX VALUE OF COGA
14427  REF   2  LAST 1263      12,3303  00017 1          STORE   COGAMAX     NOT CAUSING OVFL IN RIA CALCULATION
1443                           12,3304  77745 1  MAXCOGA DLOAD
1444   REF  12  LAST 1263      12,3305  02734 0                  CSTH
1445                           12,3306  45261 0          SR      DSU                                  PL AT 0
1446                           12,3307  20007 1                  6
1447                           12,3310  77626 0          STADR
1448   REF   2  LAST   93      12,3311  61037 1          STODL   CSTH-RHO
1449   REF   7  LAST 1258      12,3312  02675 1                  GEOMSGN
1450                           12,3313  71240 1          BMN     DLOAD
1451   REF   1                 12,3314  25505 0                  LOLIM
1452   REF   3  LAST 1264      12,3315  02740 0                  CSTH-RHO
1453                           12,3316  56352 0          SL1     DDV
1454   REF  16  LAST 1263      12,3317  02732 0                  SNTH
1455                           12,3320  77600 1          BOV
1456   REF   2  LAST 1264      12,3321  25505 0                  LOLIM
1457   REF   1                 12,3322  00011 1  MINCOGA STORE   COGAMIN    COGAMIN (+5)
1458                           12,3323  66214 0          BON     SSP
1459   REF   4  LAST  676      12,3324  00715 1                  GUESSW
1460   REF   1                 12,3325  25471 1                  NOGUESS
1461   REF   3  LAST 1253      12,3326  00051 0                  TWEEKIT
1462                           12,3327  00001 0                  00001
1463                           12,3330  77745 1          DLOAD
1464   REF   8  LAST 1261      12,3331  03775 1                  COGA

1465                           12,3332  77605 1  LAMBLOOP DMP
1466   REF  17  LAST 1264      12,3333  02732 0                  SNTH
1467                           12,3334  45342 0          SR1     DSU
1468   REF   4  LAST 1264      12,3335  02740 0                  CSTH-RHO
1469                           12,3336  65301 0          NORM    PDDL      DD=SNTH COGA-(CSTH-RHO) (+7+C(X1)) PL=2
1470   REF  75  LAST 1263      12,3337  00047 1                  X1
1471   REF   4  LAST 1263      12,3340  02736 1                  1-CSTH
1472                           12,3341  56257 1          SL*     DDV       1-CSTH  (+2)                 PL AT 0
1473                           12,3342  20170 0                  0 -9D,1
1474                           12,3343  53040 0          BMN     BZE
1475   REF   1                 12,3344  25421 1                  NEGP
1476   REF   2  LAST 1264      12,3345  25421 1                  NEGP
1477   REF   6  LAST 1261      12,3346  16742 1          STODL   P         P=(1-CSTH)/(SNTH COGA-(CSTH-RHO)) (+4)
1478   REF   9  LAST 1264      12,3347  03775 1                  COGA
1479                           12,3350  43316 1          DSQ     DAD
1480   REF   1                 12,3351  11505 1                  D1/1024
1481                           12,3352  41301 0          NORM    DMP
1482   REF  76  LAST 1264      12,3353  00047 1                  X1
1483   REF   7  LAST 1264      12,3354  02742 1                  P
1484                           12,3355  44257 1          SR*     BDSU
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1485                              12,3356  20571 C              0 -8D,1
1486  REF   5  LAST 1261         12,3357  11503 1              D1/32
1487  REF  10  LAST 1262         12,3360  16744 1        STODL R1A          R1A=2-P(1+COGA COGA) (+6)

1488  REF   8  LAST 1264         12,3361  02742 1              P
1489                              12,3362  45000 C        BOV   CALL
1490  REF   1                    12,3363  25424 1              HIENERGY
1491  REF   2  LAST 1256         12,3364  24772 C              GETX
1492                              12,3365  77745 1        DLOAD
1493  REF  17  LAST 1254         12,3366  00037 C              T
1494  REF   1                    12,3367  16764 C        STODL TPREV
1495  REF   7  LAST 1260         12,3370  00031 C              XI
1496                              12,3371  45014 C        BON   CALL
1497  REF   5  LAST 1262         12,3372  04310 1              INFINFLG
1498  REF   3  LAST 1264         12,3373  25421 1              NEGP               HAVE EXCEEDED THEORETICAL BOUNDS
1499  REF   3  LAST 1256         12,3374  24426 1              DELTIME
1500                              12,3375  44200 C        BOV   BDSU
1501  REF   1                    12,3376  25441 1              BIGTIME
1502  REF   4  LAST 1263         12,3377  02673 1              TDESIRED
1503  REF   1                    12,3400  02762 C        STORE TERRLAMB
1504                              12,3401  44246 1        ABS   BDSU
1505  REF   2  LAST 1263         12,3402  03777 C              EPSILONL
1506                              12,3403  47044 1        BPL   RTB
1507  REF   1                    12,3404  25510 1              INITV
1508  REF   2  LAST 1246         12,3405  24651 C              CHECKCTR
1509                              12,3406  45030 C        BHIZ  CALL
1510  REF   1                    12,3407  25452 C              SUFFCHEK
1511  REF   1                    12,3410  24543 C              ITERATOR
1512                              12,3411  53145 1        DLOAD BZE
1513  REF 653  LAST 1259         12,3412  00155 C              MPAC
1514  REF   2  LAST 1265         12,3413  25452 C              SUFFCHEK
1515                              12,3414  77615 C        DAD
1516  REF  10  LAST 1264         12,3415  03775 1              COGA
1517  REF  11  LAST 1265         12,3416  03775 1        STORE COGA
1518                              12,3417  77650 1        GOTO
1519  REF   1                    12,3420  25332 1              LAMBLOOP

1520                              12,3421  51145 C  NEGP DLOAD BPL            IMPOSSIBLE TRAJECTORY DUE TO INACCURATE
1521  REF   1                    12,3422  00015 C              DCOGA           BOUND CALCULATION. TRY NEW COGA.
1522  REF   1                    12,3423  25444 1              LOENERGY

1523                              12,3424  71201 1  HIENERGY SETPD DLOAD        HIGH ENERGY TRAJECTORY RESULTED
1524                              12,3425  00001 C              0
1525  REF  12  LAST 1265         12,3426  03775 1              COGA            IN OVFL OF P OR R1A, OR XI EXCEEDING 50.
1526  REF   2  LAST 1264         12,3427  00011 1        STORE COGAMIN         THIS IS THE NEW BOUND.
1527                              12,3430  70545 1  COMPONLM DLOAD SR1
1528  REF   2  LAST 1265         12,3431  00015 C              DCOGA
1529  REF   3  LAST 1265         12,3432  00015 C        STORE DCOGA           USE DCOGA/2 AS DECREMENT
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1530                          12,3433  44254 1          BZE     BDSU
15301  REF   3  LAST 1265     12,3434  25452 0                  SUFFCHEK
1531   REF  13  LAST 1265     12,3435  03775 1                  COGA
1532   REF  14  LAST 1266     12,3436  03775 1          STORE   COGA
1533                          12,3437  77650 1          GOTO                  RESTART THIS LOOP
1534   REF   2  LAST 1265     12,3440  25332 1                  LAMBLOOP


1535                          12,3441  77745 1  BIGTIME DLOAD
1536   REF   2  LAST 1265     12,3442  02764 0                  TPREV
1537   REF  18  LAST 1265     12,3443  00037 0          STORE   T


1538                          12,3444  71201 1  LOENERGY SETPD  DLOAD         LOW ENERGY TRAJECTORY RESULTED
1539                          12,3445  00001 0                  0
1540   REF  15  LAST 1266     12,3446  03775 1                  COGA          IN OVERFLOW OF TIME.
1541   REF   3  LAST 1264     12,3447  00017 1          STORE   COGAMAX       THIS IS THE NEW BOUND.
1542                          12,3450  77650 1          GOTO
1543   REF   1                12,3451  25430 1                  COMMONLM


1544                          12,3452  51545 1  SUFFCHEK DLOAD  ABS
1545   REF   2  LAST 1265     12,3453  02762 0                  TERRLAMB
1546                          12,3454  41325 0          PDDL    DMP                                   PL AT 2D
1547   REF   5  LAST 1265     12,3455  02673 1                  TDESIRED
1548   REF   4  LAST 1263     12,3456  11477 0                  D1/4
1549                          12,3457  45215 0          DAD     DSU                                   PL AT OD
1550   REF   1                12,3460  11517 1                  ONEBIT
1551                          12,3461  43044 0          BPL     SETGC
1552   REF   2  LAST 1265     12,3462  25510 1                  INITV
1553   REF   1                12,3463  02434 0                  SCLNSW
1554   REF   6  LAST 1263     12,3464  02712 1                  RTNLAMB


1555                          12,3465  43001 1  360LAMB SETPD  SETGC         LAMBERT CANNOT HANDLE CSTH=1
1556                          12,3466  00001 0                  0
1557   REF   2  LAST 1266     12,3467  02434 0                  SCLNSW
1558   REF   7  LAST 1266     12,3470  02712 1                  RTNLAMB


1559                          12,3471  71331 0  NOGUESS SSP     DLOAD
1560   REF   4  LAST 1264     12,3472  00051 0                  TWEEKIT
1561                          12,3473  10000 0                  2000D
1562   REF   3  LAST 1265     12,3474  00011 1                  COGAMIN
1563                          12,3475  65342 1          SR1     PDDL                                  PL AT 2
1564   REF   4  LAST 1266     12,3476  00017 1                  COGAMAX
1565                          12,3477  43342 0          SR1     DAD
1566                          12,3500  77626 0          STADR                                         PL AT 0
1567   REF  16  LAST 1266     12,3501  74002 0          STORE   COGA
1568   REF   4  LAST 1265     12,3502  00015 0          STORE   DCOGA
```

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1569                          12,3503  77650 1          GOTO
1570  REF  3 LAST 1266        12,3504  25332 1               LAMBLCOP


1574                          12,3505  52145 0  LOLIM   DLOAD  GOTO
1575  REF  1                  12,3506  11523 0               COGLCLIM        COGLCLIM=-.999511597
1576  REF  1                  12,3507  25322 0               MINCOGA


1577                          12,3510  60345 0  INITV   DLOAD  NORM
1578  REF 13 LAST 1263        12,3511  00041 1               R1
1579  REF 77 LAST 1264        12,3512  00047 1               X1
1580                          12,3513  70525 1          PDDL SR1                                    PL AT 2
1581  REF  9 LAST 1265        12,3514  02742 1               P
1582                          12,3515  77671 1          DDV                                         PL AT 0
1583                          12,3516  75457 0          SL*  SQRT
1584                          12,3517  20175 0               0 -4,1
1585                          12,3520  72405 0          DMP  SL1
1586  REF  3 LAST 1254        12,3521  00021 1               ROOTNU
1587                          12,3522  41206 0          PUSH DMP             OD=VTAN (+7)           PL AT 2
1588  REF 17 LAST 1266        12,3523  03775 1               COGA
1589                          12,3524  74261 1          SL   VXSC
1590                          12,3525  20206 1               5
1591  REF  7 LAST 1256        12,3526  02724 1               UR1
1592                          12,3527  77725 1          PDDL                XCH WITH OD             PL AT 0,6
1593                          12,3530  76561 1          VXSC VSL1
1594  REF  5 LAST 1256        12,3531  02676 1               UN
1595                          12,3532  53235 0          VXV  VAD                                    PL AT 0
1596  REF  8 LAST 1267        12,3533  02724 1               UR1
1597                          12,3534  43172 1          VSL1 CLEAR
1598  REF  3 LAST 1266        12,3535  02674 0               SOLNSW
1599  REF 18 LAST 1256        12,3536  02746 0          STORE VVEC
1600                          12,3537  53135 0          SLOAD BZE
1601  REF  5 LAST  480        12,3540  02704 0               VTARGTAG
1602  REF  1                  12,3541  25544 0               TARGETV
1603                          12,3542  77650 1          GOTO
1604  REF  8 LAST 1266        12,3543  02712 1               RTNLAMB


1605                          12,3544  45145 0  TARGETV DLOAD  CALL
1606  REF  6 LAST 1263        12,3545  02722 1               MAGVEC2
1607  REF  1                  12,3546  24706 0               LAMENTER
1608  REF  4 LAST  480        12,3547  02705 1          STORE VTARGET
1609                          12,3550  77650 1          GOTO
1610  REF  9 LAST 1267        12,3551  02712 1               RTNLAMB
```

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1611                          12,3552  40220 0  TIMERAD  STQ    SETPD                                  PL AT 0
1612  REF  1                  12,3553  02712 1           RTNTR
1613                          12,3554  00001 0           0
1614                          12,3555  63375 0           VLOAD  PDVL                                   PL AT 6
1615  REF  12  LAST 1256      12,3556  02657 1           RVEC
1616  REF  19  LAST 1267      12,3557  02746 0           VVEC
1617                          12,3560  77624 1           CALL
1618  REF  3  LAST 1256       12,3561  11524 1           PARAM
1619                          12,3562  71200 0           BOV    DLOAD                                  PL AT 0
1620  REF  2  LAST 1256       12,3563  24767 1           COGACVFL
1621  REF  6  LAST 1265       12,3564  11503 1           D1/32
1622                          12,3565  41225 1           DSU    DMP
1623  REF  11  LAST 1265      12,3566  02744 1           R1A
1624  REF  10  LAST 1267      12,3567  02742 1           P
1625                          12,3570  41366 1           SQRT   DMP
1626  REF  18  LAST 1267      12,3571  03775 1           COGA
1627                          12,3572  74212 0           SL4    VXSC
1628  REF  5  LAST 1256       12,3573  02714 1           U2
1629                          12,3574  45325 1           PDDL   DSU                                    PL AT 6
1630  REF  4  LAST 1260       12,3575  11475 1           D1/64
1631  REF  12  LAST 1268      12,3576  02744 1           R1A
1632                          12,3577  52361 1           VXSC   VSU                                    PL AT 0
1633  REF  9  LAST 1267       12,3600  02724 1           UR1
1634                          12,3601  53512 1           VSL4   UNIT
16345                         12,3602  77600 1           BOV
16346 REF  2  LAST 1263       12,3603  25465 1           360LAMB  NO SOLUTION SINCE CONIC IS A CIRCLE
1635                          12,3604  60325 0           PDDL   NORM    OD=UNIT(ECC) (+3)               PL AT 6
1636  REF  5  LAST  860       12,3605  02760 1           RDESIRED  36D=ECC (+3)
1637  REF  78  LAST 1267      12,3606  00047 1           X1
1638                          12,3607  41325 0           PDDL   DMP                                    PL AT 8
1639  REF  14  LAST 1267      12,3610  00041 1           R1
1640  REF  11  LAST 1268      12,3611  02742 1           P
1641                          12,3612  56257 1           SL*    DDV                                    PL AT 6
1642                          12,3613  20201 0           0,1
1643                          12,3614  56225 1           DSU    DDV
1644  REF  2  LAST 1261       12,3615  11501 0           D1/16
1645                          12,3616  00045 0           36D    36D=ECC (+3)
1646  REF  1                  12,3617  00031 0           STORE  COSF
1647                          12,3620  63400 0           BOV    DSQ
1648  REF  1                  12,3621  25661 1           BADR2
1649                          12,3622  50021 1           BDSU   BMN
1650  REF  5  LAST 1266       12,3623  11477 0           D1/4
16505 REF  2  LAST 1268       12,3624  25661 1           BADR2
1651                          12,3625  75366 0           SQRT   SIGN
1652  REF  4  LAST  860       12,3626  02757 0           SGNRCOT
16525                         12,3627  77614 1           CLEAR
1653  REF  1                  12,3630  04272 1           APSESW

1654                          12,3631  76561 1  TERMNVEC VXSC   VSL1
1655  REF  6  LAST 1267       12,3632  02676 1           UN
```

1656				12,3633	63235	0	VXV	PDVL	VXCH WITH OD PL AT 0,6
1657				12,3634	00001	0		OD	
1658				12,3635	53361	0	VXSC	VAD	PL AT 0
1659	REF	2	LAST 1268	12,3636	00031	0		COSF	
1660				12,3637	41572	1	VSL1	PUSH	OD=U2 PL AT 6
1661				12,3640	56241	0	DOT	DDV	LIMITS RESULT TO POSMAX OR NEGMAX
1662	REF	10	LAST 1268	12,3641	02724	1		UR1	
16622	REF	1		12,3642	23701	0		DP1/4	
16624				12,3643	40142	1	SR1	BOV	SCALE BACK DOWN TO NORMAL
16625				12,3644	25645	1		+1	CLEAR OVFIND IF SET
1663	REF	13	LAST 1264	12,3645	26734	0	STOVL	CSTH	CSTH (+1)
1664	REF	11	LAST 1269	12,3646	02724	1		UR1	
1665				12,3647	76435	1	VXV	VSL1	
1666				12,3650	72441	0	DOT	SL1	
1667	REF	7	LAST 1268	12,3651	02676	1		UN	
1668	REF	18	LAST 1264	12,3652	16732	0	STODL	SNTH	SNTH (+1)
1669	REF	12	LAST 1268	12,3653	02742	1		P	
1670				12,3654	77624	1	CALL		
1671	REF	3	LAST 1265	12,3655	24772	0		GETX	
1672				12,3656	77614	1	CLRGO		
16725	REF	4	LAST 1267	12,3657	02634	1		SOLNSW	
1673	REF	1		12,3660	24752	1		COMMNCUT	
1674				12,3661	75345	1	BADR2	DLOAD	SIGN
16741	REF	2	LAST 673	12,3662	11451	1			LODPHALF
16742	REF	3	LAST 1269	12,3663	00031	0			COSF
16743	REF	4	LAST 1269	12,3664	14031	0		STODL	COSF
1675	REF	4	LAST 1247	12,3665	11453	0			KEPZERO
16755				12,3666	77614	1		SETGO	
1676	REF	2	LAST 1268	12,3667	04032	1			APSESW
1677	REF	1		12,3670	25631	1			TERMNVEC
1678				12,3671	40220	0	APSIDES	STQ	SETPD PL AT 0
1679	REF	1		12,3672	02712	1			RTNAPSE
1680				12,3673	00001	0			OD
1681				12,3674	63375	0		VLOAD	PDVL PL AT 6
1682	REF	13	LAST 1268	12,3675	02657	1			RVEC
1683	REF	20	LAST 1268	12,3676	02746	0			VVEC
1684				12,3677	77624	1		CALL	
1685	REF	4	LAST 1268	12,3700	11524	1			PARAM
1686				12,3701	77600	1		BOV	PL AT 0
1687	REF	1		12,3702	25703	1			GETECC
1688				12,3703	42405	0	GETECC	DMP	SL4
1689	REF	13	LAST 1268	12,3704	02744	1			R1A
1690				12,3705	75421	1		BDSU	SQRT
1691	REF	5	LAST 1268	12,3706	11475	1			D1/64
1692	REF	2	LAST 93	12,3707	02754	0		STORE	ECC
1693				12,3710	65215	1		DAD	PDDL PL AT 2
1694	REF	1		12,3711	11471	0			D1/8

```
1695  REF  15  LAST 1268   12,3712  00041 1                R1
1696                       12,3713  72405 C       DMP      SL1
1697  REF  13  LAST 1269   12,3714  02742 1                P
1698                       12,3715  77671 1       DDV                                    PL AT  0
1699                       12,3716  60325 C       PDDL     NORM     OD=RP (+29 OR +27)    PL AT  2
1700  REF  14  LAST 1269   12,3717  02744 1                R1A
1701  REF  79  LAST 1268   12,3720  00047 1                X1
1702                       12,3721  53725 1       PDDL     SL*                            PL AT  4
1703  REF  16  LAST 127C   12,3722  00041 1                R1
1704                       12,3723  20174 1                0 -5,1
1705                       12,3724  45271 1       DDV      DSU                            PL AT 2,0
1706                       12,3725  50000 1       BOV      BMN
1707  REF   1              12,3726  25732 C                INFINAPO
1708  REF   2  LAST 127C   12,3727  25732 C                INFINAPO
1709                       12,3730  77650 1       GOTO
1710  REF   2  LAST 1269   12,3731  02712 1                RTNAPSE
1711                       12,3732  52145 C  INFINAPO DLOAD GOTO     RETURNS WITH APOAPSIS IN MPAC,PERIAPSIS
1712  REF   1              12,3733  11464 1                LDPOSMAX
1713  REF   3  LAST 127C   12,3734  02712 1                RTNAPSE  THAT PL IS AT 0.
```

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1714  REF  3 LAST 1257   04,2000                SETLOC CONICS1
1715                     04,3625                BANK

1716  REF  3 LAST 1257 TO 1259:   65    94*     COUNT  04/CONIC

1717                     04,3625   22437 1  MUTABLE  2DEC*  3.986032 E10 B-36*     MUE
1717                     04,3626   16067 1
1718                     04,3627   15625 1           2DEC*  .25087606 E-10 B+34*   1/MUE
1718                     04,3630   21042 1
1719                     04,3631   30276 1           2DEC*  1.9965049S E5 B-18*    SQRT(MUE)
1719                     04,3632   04773 0
1720                     04,3633   25004 1           2DEC*  .50087529 E-5 B+17*    1/SQRT(MUE)
1720                     04,3634   06702 1

1721                     04,3635   16471 1           2DEC   4.902778 E8 B-30       MUM
1721                     04,3636   01352 1
1722                     04,3637   21412 0           2DEC   .203966 E-8 B+28       1/MUM
1722                     04,3640   20500 0
1723                     04,3641   25477 1           2DEC*  2.21422176 E4 B-15*    SQRT(MUM)
1723                     04,3642   03367 0
1724                     04,3643   27533 1           2DEC*  .45162595 E-4 B+14*    1/SQRT(MUM)
1724                     04,3644   07571 0

1725  REF  2 LAST  493   04,3463                LODPSMAX EQUALS LODPMAX        DPPOSMAX IN LOW MEMORY.

R1727  ERASABLE ASSIGNMENTS


R1728  KEPLER SUBROUTINE

R1729      INPUT -
R1730  RREC     ERASE  +5
R1731  VREC     ERASE  +5
R1732  TAU      ERASE  +1
R1733  XKEP     ERASE  +1
R1734  TC       ERASE  +1
R1735  XPREV    ERASE  +1
 1736                          0016          1/MU      EQUALS 14D
 1737                          0020          ROOTMU    EQUALS 16D
 1738                          0022          1/ROOTMU  EQUALS 18D
R1739      OUTPUT -
R1740  RCV      ERASE  +5
R1741  VCV      ERASE  +5
R1742  RC       ERASE  +1
R1743  XPREV    ERASE  +1

R1744  DEBRIS -
 1745                          0010          ALPHA     EQUALS 8D
 1746                          0012          XMAX      EQUALS 10D
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 1747                    0014    XMIN      EQUALS 12D
 1748                    0024    X         EQUALS 20D
 1749                    0030    XI        EQUALS 24D
 1750                    0032    S(XI)     EQUALS 26D
 1751                    0034    XSQC(XI)  EQUALS 28D
 1752                    0036    T         EQUALS 30D
 1753                    0040    R1        EQUALS 32D
 1754                    0042    KEPC1     EQUALS 34D
 1755                    0044    KEPC2     EQUALS 36D
R1756  DELX      ERASE  +1
R1757  DELT      ERASE  +1
R1758  URREC1    ERASE  +5
R1759  RCNCRR    ERASE  +1
R1760  XPREV     EQUALS XKEP


R1761  LAMBERT SUBROUTINE

R1762      INPUT-
R1763  R1VEC     ERASE  +5
R1764  R2VEC     ERASE  +5
R1765  TDESIRED  ERASE  +1
R1766  GEOMSGN   ERASE  +0
R1767  GUESSW                  0 IF COGA GUESS AVAILABLE, 1 IF NOT
R1768  COGA      ERASE  +1     INPUT ONLY IF GUESSW IS ZERO.
R1769  NORMSW                  0 IF UN TO BE COMPUTED, 1 IF UN INPUT
R1770  UN        ERASE  +5     ONLY USED IF NORMSW IS 1
R1771  VTARGTAG  ERASE  +0
R1772  TWEEKIT   EQUALS 4CD    ONLY USED IF GUESSW IS 0

R1773      OUTPUT -
R1774  VTARGET   ERASE  +5     AVAILABLE ONLY IF VTARGTAG IS ZERO.
R1775  V1VEC     EQUALS MPAC

R1776      DEBRIS -
R1777  RTPLANE   ERASE  +0
R1778  U2        ERASE  +5
R1779  MAGVEC2   ERASE  +1
R1780  UR1       ERASE  +5
R1781  R1        EQUALS 31D
R1782  UN        ERASE  +5
R1783  SNTH      ERASE  +1
R1784  CSTH      ERASE  +1
R1785  1-CSTH    ERASE  +1
R1786  CSTH-RHO  ERASE  +1
 1787                    0016    COGAMAX   EQUALS 14D    CLOBBERS 1/MU
 1788                    0010    COGAMIN   EQUALS 8D
 1789                    0014    DCOGA     EQUALS 12D
R1790  TWEEKIT   EQUALS 4CD
R1791  P         ERASE  +1
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R1792   CCCA      ERASE  +1
R1793   R1A       ERASE  +1
R1794   X         EQUALS 20D
R1795   XSC       EQUALS 22D
R1796   XI        EQUALS 24D
R1797   S(XI)     EQUALS 26D
R1798   XSCC(XI)  EQUALS 28D
R1799   T         EQUALS 30D
R1800   KEPC1     EQUALS 34D
R1801   KEPC2     EQUALS 36D
R1802   SLOPESW
R1803   SCLNSW
R1804   OTHERS -

R1805   RVEC      EQUALS R1VEC
R1806   VVEC      ERASE  +5
R1807   CCCAFLAG
R1808   RVSW
R1809   INFINFLG
R1810   APSESW
R1811   36CSW
R1812   RTNTT     EQUALS RTNLAMB
R1813   ECC       ERASE  +1
R1814   RTNTR     EQUALS RTNLAMB
R1815   RTNAPSE   EQUALS RTNLAMB
R1816   R2        EQUALS MAGVEC2
 1817                          0030            COSF      EQUALS 24D
R1818   RTNPRM    ERASE  +C
R1819   SGNRDOT   ERASE  +C
R1820   RDESIRED  ERASE  +1


R1821   ITERATOR SUBROUTINE

R1822   ORDERSW
 1823                          0016            MAX       EQUALS 14D          CLOBBERS 1/NU
 1824                          0010            MIN       EQUALS 8D
R1825   INDEP     ERASE  +1
 1826                          0014            DELINDEP  EQUALS 12D
 1827                          0026            ITERCTR   EQUALS 22D
 1828                          0036            DEP       EQUALS 30D
R1829   DELDEP    ERASE  +1
R1830   DEPREV    ERASE  +1
 1831                          0050            TWEEKIT   EQUALS 40D


R1832   MORE KEPLER

R1833   EPSILONT  ERASE  +1
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L CONIC SUBROUTINES

R1834 MORE LAMBERT

R1835 TERRLAMB EQUALS DELDEP
R1836 TPREV EQUALS DEPREV

R1837 EPSILONL EQUALS EPSILONT +2 DOUBLE PRECISION WORD

R0006 1.0 INTRODUCTION
R0007 ----------
R0008
R0009 FROM A USERS POINT OF VIEW, ORBITAL INTEGRATION IS ESSENTIALLY THE SAME AS THE 278 INTEGRATION
R0011 PROGRAM. THE SAME ENTRANCES TO THE PROGRAM WILL BE MAINTAINED, THE SAME STALLING ROUTINE WILL BE USED AND
R0013 OUTPUT WILL STILL BE VIA THE PUSHLIST. THE PRIMARY DIFFERENCES TO A USER INVOLVE THE ADDED CAPABILITY OF
R0015 TERMINATING INTEGRATION AT A SPECIFIC FINAL RADIUS AND THE DIFFERENCE IN STATE VECTOR SCALING INSIDE AND OUT-
R0017 SIDE THE LUNAR SPHERE OF INFLUENCE.
R0018
R0019 IN ORDER TO MAKE THE CSM(LEM)PREC AND CSM(LEM)CONIC ENTRANCES SIMILAR TO FLIGHT 278, THE INTEGRATION PROGRAM
R0021 WILL ITSELF SET THE FINAL RADIUS (RFINAL) TO 0 SO THAT REACHING THE DESIRED TIME ONLY WILL TERMINATE
R0023 INTEGRATION. THE DP REGISTER RFINAL MUST BE SET BY USERS OF INTEGRVS AND INTEGRV, AND MUST BE DONE AFTER THE
R0025 CALL TO INTSTALL.
R0026
R0027 WHEN THE LM IS ON THE LUNAR SURFACE (INDICATED BY LUNAR SURFACE FLAG SET) CALLS TO LEMCONIC, LEMPREC, AND
R0029 INTEGRV WITH VINFLAG = 0 WILL RESULT IN THE USE OF THE PLANETARY INERTIAL ORIENTATION SUBROUTINES TO PROVIDE
R0031 BOTH THE LMS POSITION AND VELOCITY IN THE REFERENCE COORDINATE SYSTEM.
R0032 THE PROGRAM WILL PROVIDE OUTPUT AS IF INTEGRATION WAS USED. THAT IS, THE PUSHLIST WILL BE SET AS NOTED BELOW AND
R0034 THE PERMANENT STATE VECTOR UPDATED WHEN SPECIFIED BY AN INTEGRV CALL.
R0035
R0036 USERS OF INTEGRVS DESIRING INTEGRATION (INTYPFLG = 0) SHOULD NOTE THAT THE OBLATENESS PERTURBATION COMPUTATION
R0038 IN LUNAR ORBIT IS TIME DEPENDENT. THEREFORE, THE USER SHOULD SUPPLY AN INITIAL STATE VECTOR VALID AT SOME REAL
R0040 TIME AND THE DESIRED TIME (TDEC1) ALSO AT SOME REAL TIME. FOR CONIC ,,INTEGRATION,, THE USER MAY STILL USE ZERO
R0042 AS THE INITIAL TIME AND DELTA TIME AS THE DESIRED TIME.
R0043
R0044 2.0 GENERAL DESCRIPTION
R0045 ----------
R0046
R0047 THE INTEGRATION PROGRAM OPERATES AS A CLOSED INTERPRETIVE SUBROUTINE AND PERFORMS THESE FUNCTIONS---
R0049 1) INTEGRATES (PRECISION OR CONIC) EITHER CSM OR LM STATE VECTOR
R0050 2) INTEGRATES THE W-MATRIX
R0051 3) PERMANENT OR TEMPORARY UPDATE OF THE STATE VECTOR
R0052
R0053 THERE ARE SIX ENTRANCES TO THE INTEGRATION PROGRAM. FOUR OF THESE (CSMPREC, LEMPREC, CSMCONIC, LEMCONIC) SET
R0055 ALL THE FLAGS REQUIRED IN THE INTEGRATION PROGRAM ITSELF TO CAUSE THE PRECISION OR CONIC INTEGRATION (KEPLER) OF
R0057 THE LM OR CSM STATE VECTOR, AS THE NAMES SUGGEST. ONE ENTRANCE (INTEGRVS) PERMITS THE CALLING PROGRAM TO
R0059 PROVIDE A STATE VECTOR TO BE INTEGRATED. THE CALLING PROGRAM MUST SET THE FLAGS INDICATING (1) PRECISION OR
R0061 CONIC INTEGRATION, (2) IN OR OUT OF LUNAR SPHERE, (3) MIDCOURSE OR NOT, AND THE INTEGRATION PROGRAM COMPLETES
R0063 THE FLAG SETTING TO BYPASS W-MATRIX INTEGRATION. THE LAST ENTRANCE (INTEGRV, USED IN GENERAL BY THE
R0065 NAVIGATION PROGRAMS) PERMITS THE CALLER TO SET FIVE FLAGS (NOT MOONFLAG OR MIDFLAG) BUT NOT TO INPUT A STATE
R0067 VECTOR. ANY PROGRAM WHICH CALLS INTEGRVS OR INTEGRV MUST CALL INTSTALL BEFORE IT SETS THE INTEGRATION FLAGS
R0069 AND/OR STATE VECTOR.
R0070
R0071 THREE SETS OF 42 REGISTERS AND 2 FLAGS ARE USED FOR THE STATE VECTORS. TWO SETS, WHICH MAY NOT BE OVERLAYED, ARE
R0073 USED FOR THE PERMANENT STATE VECTORS FOR THE CSM AND LM. THE THIRD SET, WHICH MAY BE OVERLAYED WHEN INTEGRATION
R0075 IS NOT BEING DONE, IS USED IN THE COMPUTATIONS.
R0076
R0077 THE PERMANENT STATE VECTORS WILL BE PERIODICALLY UPDATED SO THAT THE VECTORS WILL NOT BE OLDER THAN 4 TIMESTEPS.
R0079 THE PERMANENT STATE VECTORS WILL ALSO BE UPDATED WHENEVER THE W-MATRIX IS INTEGRATED OR WHEN A CALLER OF INTEGRV
R0081 SETS STATEFLG (THE NAVIGATION PROGRAMS P20, P22.)

R0082 APPENDIX B OF THE USERS GUIDE LISTS THE STATE VECTOR QUANTITIES.
R0083
R0084 2.1 RESTARTS
R0085
R0086 PHASE CHANGES WILL BE MADE IN THE INTEGRATION PROGRAM ONLY FOR THE INTEGRV ENTRANCE (I.E., WHEN THE W-MATRIX IS
R0088 INTEGRATED OR PERMANENT STATE VECTOR IS UPDATED.) THE GROUP NUMBER USED WILL BE THAT FOR THE P20-25 PROGRAMS
R0090 (I.E., GRCLP2) SINCE THE INTEGRV ENTRANCE WILL ONLY BE USED BY THESE PROGRAMS. IF A RESTART OCCURS DURING AN
R0092 INTEGRATION OF THE STATE VECTOR ONLY, THE RECOVERY WILL BE TO THE LAST PHASE IN THE CALLING PROGRAM. CALLING
R0094 PROGRAMS WHICH USE THE INTEGRV OR INTEGRVS ENTRANCE OF INTEGRATION SHOULD ENSURE THAT IF PHASE CHANGING IS DONE
R0096 THAT IT IS PRIOR TO SETTING THE INTEGRATION INPUTS IN THE PUSHLIST.
R0097 THIS IS BECAUSE THE PUSHLIST IS LOST DURING A RESTART.
R0098
R0099 2.2 SCALING
R0100
R0101 THE INTEGRATION ROUTINE WILL MAINTAIN THE PERMANENT MEMORY STATE VECTORS IN THE SCALING AND UNITS DEFINED IN
R0103 APPENDIX B OF THE USERS GUIDE. THE SCALING OF THE OUTPUT POSITION VECTORDEPENDS ON THE ORIGIN OF THE COORDINATE
R0105 SYSTEM AT THE DESIRED INTEGRATION TIME. THE COORDINATE SYSTEM TRANSFORMATION WILL BE DONE AUTOMATICALLY ON
R0107 MULTIPLE TIMESTEP ENCKE INTEGRATION ONLY. THUS IT IS POSSIBLE TO HAVE OUTPUT FROM SUCCESSIVE INTEGRATIONS IN
R0109 DIFFERENT SCALING.
R0110 HOWEVER, RATT, VATT WILL ALWAYS BE SCALED THE SAME.
R0111
R0112 3.0 INPUT/OUTPUT
R0113 ----------
R0114
R0115 PROGRAM INPUTS ARE THE FLAGS DESCRIBED IN APPENDIX A AND THE PERMANENT STATE VECTOR QUANTITIES DESCRIBED IN AP-
R0117 PENDIX B OF THE USERS GUIDE, PLUS THE DESIRED TIME TO INTEGRATE TO IN TDEC1 (A PUSH LIST LOCATION).
R0119 FOR INTEGRVS, THE RCV,VCV, TET OF THE TEMPORARY STATE VECTOR MUST BE SET, PLUS MOONFLAG AND MIDFLAG
R0121
R0122 FOR SIMULATION THE FOLLOWING QUANTITIES MUST BE PRESET ---

				EARTH	MOON
				29	27
R0126	RRECTCSM(LEM) - RECTIFIED POSITION VECTOR	METERS	2	2	
R0127					
R0128				7	5
R0129	VRECTCSM(LEM) - RECTIFIED VELOCITY VECTOR	M/CSEC	2	2	
R0130					
R0131				28	28
R0132	TETCSM(LEM) - TIME STATE VECTOR IS VALID	CSEC	2	2	
R0133	CUSTOMARILY 0, BUT NOTE LUNAR				
R0134	ORBIT DEPENDENCE ON REAL TIME.				
R0135					
R0136				22	18
R0137	DELTAVCSM(LEM) - POSITION DEVIATION	METERS	2	2	
R0138	0 IF TCCSM(LEM) = 0				
R0139					
R0140				3	-1
R0141	NUVCSM(LEM) - VELOCITY DEVIATION	M/CSEC	2	2	
R0142	0 IF TCCSM(LEM) = 0				
R0143					

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R0144                                                          29      27
R0145      RCVCSM(LEM)    - CONIC POSITION                 METERS 2       2
R0146                       EQUALS RRECTCSM(LEM) IF
R0147                       TCCSM(LEM) = 0
R0148
R0149                                                          7       5
R0150      VCVCSM(LEM)    - CONIC VELOCITY                 M/CSEC 2       2
R0151                       EQUALS VRECTCSM(LEM) IF
R0152                       TCCSM(LEM) = 0
R0153
R0154                                                          28      28
R0155      TCCSM(LEM)     - TIME SINCE RECTIFICATION       CSECS  2       2
R0156                       CUSTOMARILY 0
R0157
R0158                                                          1/2     17      16
R0159      XKEPCSM(LEM)   - ROOT OF KEPLERS EQUATION       M      2       2
R0160                       0 IF TCCSM(LEM) = 0
R0161
R0162      CMCCNFLG       - PERMANENT FLAGS CORRESPONDING                 0       0
R0163      CMIDFLAG         TO MOONFLAG AND MIDFLAG                       0,1     0,1
R0164      LMCCNFLG         C = CSM, L = LM                               0       0
R0165      LMIDFLG                                                        0,1     0,1
R0166
R0167      SURFFLAG       - LUNAR SURFACE FLAG                            0,1     0,1
R0168
R0169  IN ADDITION, IF (L)CMIDFLAG IS SET, THE INITIAL INPUT VALUES FOR LUNAR
R0170  SOLAR EPHEMERIDES SUBROUTINE AND PLANETARY INERTIAL ORIENTATION SUB-
R0171  ROUTINE MUST BE PRESET.
R0172
R0173  OUTPUT
R0174  AFTER EVERY CALL TO INTEGRATION
R0175                                                                  EARTH   MOON
R0176                                                                  29      29
R0177      0D    RATT    POSITION                         METERS 2       2
R0178                                                                  7       7
R0179      6D    VATT    VELOCITY                         M/CSEC 2       2
R0180                                                                  28      28
R0181      12D   TAT     TIME                                   2       2
R0182                                                                  29      27
R0183      14D   RATT1   POSITION                         METERS 2       2
R0184                                                                  7       5
R0185      20D   VATT1   VELOCITY                         M/CSEC 2       2
R0186                                                                  3   2   36      30
R0187      26D   ML(P)   ML                               M /CS  2       2
R0188
R0189      X1             MUTABLE ENTRY                           -2      -100
R0190
R0191      X2             COORDINT
R0192      X2             COORDINATE SYSTEM ORIGIN                0       2
R0193                     (THIS, NOT MOONFLAG, SHOULD BE
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R0194                   USED TO DETERMINE ORIGIN.)
R0195
R0196   IN ADDITION TO THE ABOVE, THE PERMANENT STATE VECTOR IS UPDATED WHENEVER
R0197   STATEFLG WAS SET AND WHENEVER A W-MATRIX IS TO BE INTEGRATED. THE PUSH
R0198   COUNTER IS SET TO 0 AND OVERFLOW IS CLEARED BEFORE RETURNING TO THE
R0199   CALLING PROGRAM.
R0200
R0201   4.0 CALLING SEQUENCES AND SAMPLE CODE
R0202   ------------------------------------
R0203
R0204       A) PRECISION ORBITAL INTEGRATION. CSMPREC,LEMPREC ENTRANCES
R0205             L-X     STORE TIME TO 95T5791TS T  95 PUS  L9ST (T4531)
R0206             L       CALL
R0207             L+1             CSMPREC (OR LEMPREC)
R0208             L+2     RETURN
R0209          INPUT                                                  28
R0210             TDEC1 (PD 32D) TIME TO INTEGRATE TO...CENTISECONDS SCALED 2
R0211          OUTPUT
R0212             THE DATA LISTED IN SECTION 3.0 PLUS
R0213             RCVV   POSITION VECTOR OF VEHICLE WITH RESPECT TO SECONDARY
R0214             BODY... METERS B-29 ONLY IF MIDFLAG = DIMOFLAG = 1
R0215       B) CONIC INTEGRATION. CSMCONIC, LEMCONIC ENTRANCES
R0216             L-X     STORE TIME IN PUSH LIST (TDEC1)
R0217             L       CALL
R0218             L+1             CSMCONIC (OR LEMCONIC)
R0219          INPUT/OUTPUT
R0220             SAME AS PRECISION INTEGRATION, EXCEPT RQVV NOT SET
R0221       C) INTEGRATE GIVEN STATE VECTOR. INTEGRVS ENTRANCE
R0222                   CALL
R0223                           INTSTALL
R0224                   VLOAD
R0225                           POSITION VECTOR
R0226                   STOVL   RCV
R0227                           VELOCITY VECTOR
R0228                   STODL   VCV
R0229                           TIME STATE VECTOR VALID
R0230                   STODL   TET
R0231                           FINAL RADIUS
R0232                   STORE   RFINAL
R0233                   SET(CLEAR)  SET(CLEAR)
R0234                               INTYPFLAG
R0235                               MCONFLAG
R0236                   SET(CLEAR)  DLOAD
R0237                               DESIRED TIME
R0238                   STCALL      TDEC1
R0239                               INTEGRVS
R0240          INPUT
R0241             RCV   POSITION VECTOR                    METERS
R0242             VCV   VELOCITY VECTOR                    M/CSEC
R0243             TET   TIME OF STATE VECTOR(MAY = 0)      CSEC B-28
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R0244            TDEC1  TIME TO INTEGRATE TO                CSEC B-28 (PD 32D)
R0245                   (MAY BE INCREMENT IF TET=0)
R0246         OUTPUT
R0247            SAME AS FOR PRECISION OR CONIC INTEGRATION,
R0248            DEPENDING ON INTYPFLG.
R0249      D) INTEGRATE STATE VECTOR.INTGRV ENTRANCE
R0250            L-X    STORE TIME IN PUSH LIST (TDEC1)(MAY BE DONE AFTER CALL TO INTSTALL)
R0252            L-8    CALL
R0253            L-7
R0254            L-6    SET(CLEAR) SET(CLEAR)
R0255            L-5               VINTFLAG    1=CSM, 0=LM
R0256            L-4               INTYPFLAG   1=CONIC, 0=PRECISION
R0257            L-3    SET(CLEAR) SET(CLEAR)
R0258            L-2               DIMOFLAG    1=W-MATRIX, 0=NO W-MATRIX
R0259            L-1               D6OR9FLG    1=9X9, 0=6X6
R0260            L      SET        CLCAD
R0261            L+1               STATEFLG    DESIRE PERMANENT UPDATE
R0262            L+2               FINAL RAD. OF STATE VECTOR
R0263            L+3    STCALL     RFINAL
R0264            L+4               INTEGRV
R0265            L      CALL                   NORMAL USE-- WILL UPDATE STATE
R0266            L+1               INTEGRV     VECTOR IF DIMOFLAG=1.(STATEFLG IS
R0267            L+2    RETURN                 ALWAYS RESET IN INTEGRATION AFTER
R0268                                          IT IS USED.)
R0269         INPUT
R0270            TDEC1 (PD 320) TIME TO INTEGRATE TO    CSEC B-28
R0271         OUTPUT
R0272            SAME AS FOR PRECISION OR CONIC INTEGRATION
R0273         THE PROGRAM WILL SET MOONFLAG, MIDFLAG DEPENDING ON
R0274         THE PERMANENT STATE VECTOR REPRESENTATION.

02741                                11,2310                    BANK    11
02742  REF   2  LAST  202            13,2000                    SETLOC  INTINIT
02743                                13,2561                    BANK
02744  REF   5  LAST  206            E3,1554                    EBANK=  RRECTCSM
02745  REF   2 LAST  202 TO  205:     30     30*                COUNT   13/INTIN

02275  REF  93  LAST 1223    13,2561  0 5301 0  STATEINT TC      PHASCHNG
02276                        13,2562   00052 0               OCT     00052
02277  REF   7  LAST  260    13,2563  3 4754 0               CAF     PRIO5
02278  REF  30  LAST  776    13,2564  0 5042 1               TC      FINDVAC
02279  REF   6  LAST 1279    E3,1554                         EBANK=  RRECTCSM
02280  REF   2  LAST  206    13,2565   02570 1               2CADR   STATINT1
02280                        13,2566   26063 0
02281  REF  64  LAST 1202    13,2567  0 5213 1               TC      TASKOVER
02282  REF 234  LAST 126C    13,2570  0 6006 1  STATINT1 TC      INTPRET
02283                        13,2571   47014 1               BON     RTB
02831  REF   2  LAST  259    13,2572   04712 1                       QUITFLAG
02832  REF   1                13,2573   26630 0                       NOINT          NO STATEINT IF V96
0284   REF  26  LAST  886    13,2574   45505 0                       LOADTIME
```

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0286   REF  48  LAST  886   13,2575   00041 1          STORE  TDEC1
0323                        13,2576   77624 1          CALL
0324   REF  22  LAST 1223   13,2577   27371 1                 INTSTALL
0325                        13,2600   45014 C          SET    CALL
03251  REF   2  LAST  203   13,2601   01076 1                 NODOFLAG
0326   REF   2  LAST  203   13,2602   26621 C                 SETIFLGS
0327                        13,2603   77650 1          GOTO
0328   REF   1             13,2604   26000 C                 STATEUP
0356                        13,2605   00003 1  600SECS 2DEC   60000
0356                        13,2606   25140 C
0404                        13,2607   77414 C  ENDINT  CLEAR  EXIT
0405   REF   3  LAST  599   13,2610   01672 C                 STATEFLG
0408   REF  54  LAST 1279   13,2611   0 5301 C         TC     PHASCHNG
0409                        13,2612    20032 1         OCT    20032
0411                        13,2613   0 0006 1         EXTEND
0412   REF   2  LAST  206   13,2614   3 2606 0         DCA    600SECS
0413   REF   3  LAST  639   13,2615   0 5231 1         TC     LONGCALL
0414   REF   6  LAST  259   E3,1554                    EBANK= RRECTHIS
0415   REF   3  LAST  206   13,2616    02561 1         2CADR  STATEINT
0415                        13,2617    26063 C
0416   REF 107  LAST 1006   13,2620   0 5112 C         TC     ENDOFJOB
0426                        13,2621   43014 C  SETIFLGS SET    CLEAR
0427   REF   4  LAST 1280   13,2622   01472 1                 STATEFLG
0428   REF  13  LAST  865   13,2623   01673 1                 INTYPFLG
0429                        13,2624   43014 C          CLEAR  CLEAR
0430   REF  11  LAST  612   13,2625   01676 1                 DIMOFLAG
04301  REF   5  LAST  599   13,2626   01675 1                 D60RSFLG
04302                       13,2627   77616 C          RVQ
04303                       13,2630   77776 1  NOINT   EXIT
04304  REF  55  LAST 1280   13,2631   0 5301 C         TC     PHASCHNG
04305                       13,2632    00002 C         OCT    2

04306  REF  54  LAST 1034   13,2633   0 5447 C         TC     DOWNFLAG
04307  REF   3  LAST 1279   13,2634    00221 C         ADRES  QUITFLAG

04308  REF 108  LAST 1280   13,2635   0 5112 C         TC     ENDOFJOB

R0431  ATOPCSM TRANSFERS RRECT TO RRECT +41 TO RRECTCSM TO RRECTCSM +41

R0432  CALLING SEQUENCE
R0433     L   CALL
R0434     L+1         ATOPCSM

R0435  NORMAL EXIT AT L+2

0436                        13,2636   47020 C  ATOPCSM STQ    RTB
0437   REF  27  LAST 1259   13,2637    00051 C                S2
0438   REF   3  LAST 1227   13,2640    26651 1                MOVEACSM
0439                        13,2641    45014 C         SET    CALL
0440   REF  21  LAST  619   13,2642    04063 C                CMOONFLG
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0441  REF   3  LAST 1227   13,2643   20237 C                  SVDWN1
0442                       13,2644   43014 C           BON    CLRGC
0443  REF  12  LAST  866   13,2645   00303 1                  MOONFLAG
0444  REF  28  LAST 1280   13,2646   00051 C                  S2
0445  REF  22  LAST 1280   13,2647   04223 C                  CMOONFLG
0446  REF  29  LAST 1281   13,2650   00051 C                  S2
0447  REF   1               13,2651   0 3015 C  MOVEACSM TC     SETBANK
0448  REF   2  LAST   82   13,2652   55'500 1          TS     DIFFCCNT      INITIALIZE INDEX
0449  REF   3  LAST 1281   13,2653   51'500 C          INDEX  DIFFCCNT
0450  REF   5  LAST 1243   13,2654   3 1502 1          CA     RRECT
0451  REF   4  LAST 1281   13,2655   51'500 C          INDEX  DIFFCCNT
0452  REF   7  LAST 1279   13,2656   55'554 C          TS     RRECTCSM
0453  REF   5  LAST 1281   13,2657   11'500 1          CCS    DIFFCCNT      IS TRANSFER COMPLETE
0454  REF   4  LAST 1280   13,2660   1 2652 C          TCF    MOVEACSM +1   NO-LOOP
0455  REF  63  LAST 1253   13,2661   0 6030 1          TC     DANZIG        COMPLETE- RETURN


R0456  PTCACSM TRANSFERS RRECTCSM TO RRECTCSM +41 TO RRECT TO RRECT +41

R0457  CALLING SEQUENCE
R0458     L   CALL
R0459              PTCACSM

R0460  NORMAL EXIT AT L+2
0461                       13,2662   43034 1  PTOACSM  RTB    BON
0462  REF   2  LAST 1227   13,2663   26700 1                  MOVEPCSM
0463  REF  23  LAST 1281   13,2664   04303 C                  CMOONFLG
0464  REF   1               13,2665   26673 1                  SETMCDN
0465                       13,2666   66214 C  CLRMOON  CLEAR  SSP
0466  REF  13  LAST 1281   13,2667   00263 C                  MOONFLAG
0467  REF   4  LAST 1226   13,2670   02151 C                  PBODY
0468                       13,2671   00000 1                  0
0469                       13,2672   77616 C           RVQ
0470                       13,2673   66214 C  SETMOON  SET    SSP
0471  REF  14  LAST 1281   13,2674   00063 1                  MOONFLAG
0472  REF   5  LAST 1281   13,2675   02151 C                  PBODY
0473                       13,2676   00002 C                  2
0474                       13,2677   77616 C           RVQ
0475  REF   2  LAST 1281   13,2700   0 3015 C  MOVEPCSM TC     SETBANK
0476  REF   6  LAST 1281   13,2701   55'500 1          TS     DIFFCCNT
0477  REF   7  LAST 1281   13,2702   51'500 C          INDEX  DIFFCCNT
0478  REF   8  LAST 1281   13,2703   3 1554 1          CA     RRECTCSM
0479  REF   8  LAST 1281   13,2704   51'500 C          INDEX  DIFFCCNT
0480  REF   6  LAST 1281   13,2705   55'502 C          TS     RRECT
0481  REF   9  LAST 1281   13,2706   11'500 1          CCS    DIFFCCNT
0482  REF   3  LAST 1281   13,2707   1 2701 1          TCF    MOVEPCSM +1
0483  REF  64  LAST 1281   13,2710   0 6030 1          TC     DANZIG


R0484  ATCPLEM  TRANSFERS RRECT TO RRECT +41 TO RRECTLEM TO RRECTLEM +41
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0485                              13,2711   47020 C  ATOPLEM  STQ     RTB
0486   REF  30  LAST 1281        13,2712   00051 C            S2
0487   REF   2  LAST 1226        13,2713   26724 1            MOVEALEM
0488                              13,2714   45014 C            SET     CALL
0489   REF   3  LAST  576        13,2715   04064 1            LMOONFLG
0490   REF   3  LAST 1226        13,2716   20263 1            SVDWN2
0491                              13,2717   43014 C            BON     CLRGC
0492   REF  15  LAST 1281        13,2720   00303 1            MOONFLAG
0493   REF  31  LAST 1282        13,2721   00051 C            S2
0494   REF   4  LAST 1282        13,2722   04224 1            LMOONFLG
0495   REF  32  LAST 1282        13,2723   00051 C            S2
0496   REF   3  LAST 1281        13,2724   0 3015 C  MOVEALEM TC      SETBANK
0497   REF  10  LAST 1281        13,2725   55'500 1           TS      DIFEGCNT
0498   REF  11  LAST 1282        13,2726   51'500 C           INDEX   DIFEGCNT
0499   REF   7  LAST 1281        13,2727   3 1502 1           CA      RRECT
0500   REF  12  LAST 1282        13,2730   51'500 C           INDEX   DIFEGCNT
0501   REF   2  LAST   83        13,2731   55'626 C           TS      RRECTLEM
0502   REF  13  LAST 1282        13,2732   11'500 1           CCS     DIFEGCNT
0503   REF   3  LAST 1282        13,2733   1 2725 1           TCF     MOVEALEM +1
0504   REF  65  LAST 1281        13,2734   C 6030 1           TC      DANZIG

R0505  PTCALEM  TRANSFERS RRECTLEM TO RRECTLEM +41 TO RREGT TO RREGT +41

0506                              13,2735   47014 1  PTOALEM  BON     RTB
0507   REF   4  LAST  260        13,2736   04307 1            SURFFLAG
0508   REF   1                   13,2737   26756 1            USEPIOS
0509   REF   2  LAST 1226        13,2740   26745 C            MOVEPLEM
0510                              13,2741   52014 C            BON     GOTO
0511   REF   5  LAST 1282        13,2742   04304 1            LMOONFLG
0512   REF   2  LAST 1281        13,2743   26673 1            SETMCON
0513   REF   1                   13,2744   26666 C            CLRMCON
0514   REF   4  LAST 1282        13,2745   0 3015 C  MOVEPLEM TC      SETBANK
0515   REF  14  LAST 1282        13,2746   55'500 1           TS      DIFEGCNT
0516   REF  15  LAST 1282        13,2747   51'500 C           INDEX   DIFEGCNT
0517   REF   3  LAST 1282        13,2750   3 1626 1           CA      RRECTLEM
0518   REF  16  LAST 1282        13,2751   51'500 C           INDEX   DIFEGCNT
0519   REF   8  LAST 1282        13,2752   55'502 C           TS      RREGT
0520   REF  17  LAST 1282        13,2753   11'500 1           CCS     DIFEGCNT
0521   REF   3  LAST 1282        13,2754   1 2746 1           TCF     MOVEPLEM +1
0522   REF  66  LAST 1282        13,2755   0 6030 1           TC      DANZIG

0523                              13,2756   77201 1  USEPIOS  SETPD   VLOAD
0524                              13,2757   00001 C                   0
0525   REF  10  LAST 1209        13,2760   02026 1                   RLS
0526                              13,2761   41525 C            PDDL    PUSH
0527   REF  49  LAST 1280        13,2762   00041 1                   TDEC1
0528   REF  12  LAST  865        13,2763   15517 C            STODL   TET
0529   REF   1                   13,2764   27753 C                   5/8
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0530                                13,2765   77624 1          CALL
0531   REF   8  LAST 1205          13,2766   55341 1                RP-TC-R
0532   REF  15  LAST 1248          13,2767   25535 0          STOVL RCV
0533   REF   2  LAST   32          13,2770   11445 1                ZUNIT
0534                                13,2771   14001 0          STODL 0D
0535   REF  13  LAST 1282          13,2772   01517 0                TET
0536                                13,2773   14007 0          STODL 6D
0537   REF   2  LAST 1282          13,2774   27753 0                5/8
0538                                13,2775   45014 0          SET   CALL          NEEDED FOR SETTING X1 ON EXIT
05381  REF  16  LAST 1282          13,2776   00063 1                MOONFLAG
0539   REF   9  LAST 1283          13,2777   55341 1                RP-TC-R
0540                                13,3000   74235 0          VXV   VXSC
0541   REF  16  LAST 1283          13,3001   01535 0                RCV
0542   REF   1                     13,3002   27014 1                OMEGMOON
0543   REF  14  LAST 1248          13,3003   25543 1          STOVL VCV
0544   REF   8  LAST 1205          13,3004   11453 0                ZEROVEC
0545   REF   6  LAST 1226          13,3005   01521 0          STORE TDELTAV
0546                                13,3006   67174 1          AXT,2 SXA,2
0547                                13,3007   00002 0                2
0548   REF   6  LAST 1281          13,3010   02150 1                PBODY
0549   REF   6  LAST 1226          13,3011   35527 1          STCALL TNUV
0550   REF   1                     13,3012   27136 0                A-PCHK
0551                                13,3013   07112 1  OMEGMOON 2DEC* 2.66169947 E-8 B+23*
0551                                13,3014   06620 0
0552   REF   1                     13,3015   3 3021 1 SETBANK CAF   INTBANK
0553   REF  30  LAST 1199          13,3016   54 006 0         TS    BBANK
0554   REF   1                     13,3017   3 3436 0         CAF   FORTYONE
0555   REF 301  LAST 1201          13,3020   0 0002 0         TC    Q
0556   REF   9  LAST 1281          E3,1554                    EBANK= RRECTCSM
0557   REF  10  LAST  612          13,3021    26063 0 INTBANK BBCON INTEGRV


R0558   SPECIAL PURPOSE ENTRIES TO ORBITAL INTEGRATION. THESE ROUTINES PROVIDE ENTRANCES TO INTEGRATION WITH
R0560   APPROPRIATE SWITCHES SET OR CLEARED FOR THE DESIRED INTEGRATION.

R0561   CSMPREC AND LEMPREC PERFORM ORBIT INTEGRATION BY THE ENCKE METHOD TO THE TIME INDICATED IN TDEC1
R0563   ACCELERATIONS DUE TO OBLATENESS ARE INCLUDED. NO W-MATRIX INT. IS DONE.
R0564   THE PERMANENT STATE VECTOR IS NOT UPDATED.
R0565   CSMCONIC AND LEMCONIC PERFORM ORBIT INTEG. BY KEPLERS METHOD TO THE TIME INDICATED IN TDEC1
R0567   NO DISTURBING ACCELERATIONS ARE INCLUDED. IN THE PROGRAM FLOW THE GIVEN
R0568   STATE VECTOR IS RECTIFIED BEFORE SOLUTION OF KEPLERS EQUATION

R0569   THE ROUTINES ASSUME THAT THE CSM (LEM) STATE VECTOR IN P-MEM IS VALID.
R0570   SWITCHES SET PRIOR TO ENTRY TO THE MAIN INTEG. PROG ARE AS FOLLOWS
R0571                  CSMPREC  CSMCONIC   LEMPREC  LEMCONIC
R0572   VINTFLAG        SET       SET       CLEAR     CLEAR
R0573   INTYPFLG        CLEAR     SET       CLEAR     SET
R0574   DIMOFLAG        CLEAR     CLEAR     CLEAR     CLEAR
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R0575   CALLING SEQUENCE
R0576      L-X  STORE TDEC1
R0577      L    CALL       (STCALL TDEC1)
R0578      L+1             CSMPREC (CSMCONIC, LEMPREC, LEMCONIC)

R0579    NORMAL EXIT TO L+2


R0580   SUBROUTINES CALLED
R0581     INTEGRV1
R0582     PRECCLT FOR CSMPREC AND LEMPREC
R0583     CCNICCLT  FOR CSMCONIC AND LEMCONIC


R0584   OLTPLT - SEE PAGE 2 OF THIS LOG SECTION
R0585   INPLT
R0586    TDEC1   TIME TO INTEGRATE TO . CSECS E-28
 0587                          13,3022   45020 1  CSMPREC  STQ      CALL
 0588   REF   80  LAST 1270   13,3023   00046 0                    X1
 0589   REF   23  LAST 1280   13,3024   27371 1                    INTSTALL
 0590                          13,3025   43130 1           SXA,1    SET
 0591   REF    2  LAST   86   13,3026   02214 1                    IRETURN
 0592   REF   10  LAST  599   13,3027   01474 1                    VINTFLAG
 0593                          13,3030   43014 0  IFLAGP   SET      CLEAR
 0594   REF    3  LAST  203   13,3031   01467 0                    PRECIFLG
 0595   REF   12  LAST 1280   13,3032   01676 1                    DIMOFLAG
 0596                          13,3033   77614 1           CLRGO
 05961  REF   14  LAST 1280   13,3034   01633 0                    INTYPFLG
 05962  REF    1              13,3035   27115 1                    INTEGRV1
 0597                          13,3036   45020 1  LEMPREC  STQ      CALL
 0598   REF   81  LAST 1284   13,3037   00046 0                    X1
 0599   REF   24  LAST 1284   13,3040   27371 1                    INTSTALL
 0600                          13,3041   43130 1           SXA,1    CLRGO
 0601   REF    3  LAST 1284   13,3042   02214 1                    IRETURN
 0602   REF   11  LAST 1284   13,3043   01634 1                    VINTFLAG
 0603   REF    1              13,3044   27030 1                    IFLAGP

 0604                          13,3045   45020 1  CSMCONIC STQ      CALL
 0605   REF   82  LAST 1284   13,3046   00046 0                    X1
 0606   REF   25  LAST 1284   13,3047   27371 1                    INTSTALL
 0607                          13,3050   43130 1           SXA,1    SET
 0608   REF    4  LAST 1284   13,3051   02214 1                    IRETURN
 0609   REF   12  LAST 1284   13,3052   01474 1                    VINTFLAG
 0610                          13,3053   43014 0  IFLAGC   CLEAR    SETGC
 0611   REF   13  LAST 1284   13,3054   01676 1                    DIMOFLAG
 0612   REF   15  LAST 1284   13,3055   01433 1                    INTYPFLG
 0613   REF    2  LAST 1284   13,3056   27115 1                    INTEGRV1
 0614                          13,3057   45020 1  LEMCONIC STQ      CALL
 0615   REF   83  LAST 1284   13,3060   00046 0                    X1
```

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0616  REF  26  LAST 1284   13,3061  27371 1                 INTSTALL
0617                       13,3062  43130 1        SXA,1    CLRGC
0618  REF   5  LAST 1284   13,3063  02214 1                 IRETURN
0619  REF  13  LAST 1284   13,3064  01634 1                 VINTFLAG
0620  REF   1              13,3065  27053 1                 IFLAGC

0621                       13,3066  66214 C  INTEGRVS SET   SSP
0622  REF   4  LAST 1284   13,3067  01467 C                 PRECIFLG
0623  REF   7  LAST 1283   13,3070  02151 C                 PBODY
0624                       13,3071  00000 1                 0
0625                       13,3072  66214 C        BOF      SSP
0626  REF  17  LAST 1283   13,3073  00343 C                 MOONFLAG
0627                       13,3074  27077 1                 +3
0628  REF   8  LAST 1285   13,3075  02151 C                 PBODY
06281                      13,3076  00002 C                 2
0629                       13,3077  77220 1        STQ      VLOAD
0630  REF   6  LAST 1285   13,3100  02214 1                 IRETURN
0631  REF   9  LAST 1283   13,3101  11453 C                 ZEROVEC
0632  REF   7  LAST 1283   13,3102  01521 C        STORE    TDELTAV
0633  REF   7  LAST 1283   13,3103  35527 1        STCALL   TNUV
0634  REF   2  LAST 1226   13,3104  23344 C                 RECTIFY
0635                       13,3105  43014 C        CLEAR    SET
0636  REF  14  LAST 1284   13,3106  01676 1                 DIMOFLAG
0637  REF   1              13,3107  04062 1                 NEWIFLG
06371                      13,3110  77614 1        SETGO
06372 REF   1              13,3111  04020 1                 RPQFLAG
0638  REF   1              13,3112  27127 C                 ALOADED
R0639  INTEGRV IS AN ENTRY TO ORBIT INTEGRATION WHICH PERMITS THE CALLER ,
R0640  NORMALLY THE NAVIGATION PROGRAM ,TO SET THE INTEG. FLAGS. THE ROUTINE
R0641  IS ENTERED AT INTEGRV1 BY CSMPREC ET.AL. AND AT ALOADED BY INTEGRVS.
R0642  THE ROUTINE SETS UP A-MEMORY IF ENTERED AT INTEGRV,1 AND SETS THE INTEG.
R0643  PROGRAM FOR PRECISION OR CONIC

R0644  THE CALLER MUST FIRST CALL INTSTALL TO CHECK IF INTEG. IS IN USE BEFORE
R0645  SETTING ANY FLAGS.
R0646  THE FLAGS WHICH SHOULD BE SET OR CLEARED ARE
R0647    VINTFLAG    (IGNORED WHEN ENTERED FROM INTEGRVS)
R0648    INTYPFLG
R0649    DIMOFLAG
R0650    RCSFLG
R0651  CALLING SEQUENCE
R0652    L-X    CALL
R0653    L-Y           INTSTALL
R0654    L-1    SET OR CLEAR ALL FOUR FLAGS. ALSO CAN SET STATEFLG IF DESIRED
R0655           AND DIMOFLAG IS CLEAR.
R0656    L      CALL
R0657    L+1           INTEGRV
R0658  INITIALIZATION
R0659    FLAGS AS ABOVE
R0660    STORE TIME TO INTEGRATE TO IN TDEC1
```

```
R0661   CLIPL1
R0662     RATT   AS
R0663     VATT       DEFINED
R0664     TAT                BEFORE


0665                          13,3113   77620 C  INTEGRV  STQ
0666   REF   7  LAST 1285    13,3114   02214 1                    IRETURN
0667                          13,3115   43014 C  INTEGRV1 SET      SET
0668   REF   2  LAST 1285    13,3116   04060 C                    RPQFLAG
0669   REF   2  LAST 1285    13,3117   04062 1                    NEWIFLG
0670                          13,3120   77731 1  INTEGRV2 SSP
0671   REF  21  LAST 1227    13,3121   00053 1                    QPRET
0672   REF   2  LAST 1285    13,3122   27127 C                    ALOADED
0673                          13,3123   52014 C           BON      GOTO
0674   REF  14  LAST 1285    13,3124   01714 1                    VINTFLAG
0675   REF   2  LAST  258    13,3125   26662 1                    PTOACSM
0676   REF   1                13,3126   26735 1                    PTOALEM
0677                          13,3127   77745 1  ALOADED  DLOAD
0678   REF  50  LAST 1282    13,3130   00041 1                    TDEC1
0679   REF   2  LAST   75    13,3131   01101 C           STORE    TDEC
0680                          13,3132   52014 C           BOFF     GOTO
0681   REF  16  LAST 1284    13,3133   01753 1                    INTYPFLG
0682   REF   1                13,3134   27234 1                    TESTLOOP
0683   REF   1                13,3135   27220 1                    RVCON
0684                          13,3136   77414 0  A-PCHK   BOFCLR   EXIT
0685   REF   5  LAST 1280    13,3137   01652 1                    STATEFLG
0686   REF   1                13,3140   27157 1                    RECTOUT
0687   REF  96  LAST 1280    13,3141  0 5301 C           TC       PHASCHNG
0688                          13,3142   04022 C           OCT      04022
0689   REF  49  LAST 1224    13,3143  0 5435 C           TC       UPFLAG        PHASE CHANGE HAS OCCURRED BETWEEN
0690   REF   3  LAST 1224    13,3144   00236 0           ADRES    REINTFLG      INTSTALL AND INTWAKE
0692   REF 235  LAST 1279    13,3145  0 6006 1           TC       INTPRET
0693                          13,3146   77731 1           SSP
0694   REF  22  LAST 1286    13,3147   00053 1                    QPRET
0695   REF   1                13,3150   27155 C                    PHEXIT
0696                          13,3151   52014 C           BON      GOTO
0697   REF  15  LAST 1286    13,3152   01714 1                    VINTFLAG
0698   REF   2  LAST   32    13,3153   26636 0                    ATOPCSM
0699   REF   2  LAST   32    13,3154   26711 1                    ATOPLEM
0700                          13,3155   77624 1  PHEXIT   CALL
0701   REF  22  LAST 1227    13,3156   56712 C                    GRP2PC
0702                          13,3157   45001 1  RECTOUT  SETPD    CALL
0703                          13,3160   00001 0                    0
0704   REF   3  LAST 1285    13,3161   23344 0                    RECTIFY
0705                          13,3162   53775 1           VLOAD    VSL*
0706   REF   9  LAST 1282    13,3163   01503 0                    RRECT
0707                          13,3164   57576 1                    0,2
0708                          13,3165   53715 1           PDVL     VSL*          RATT TO PDO
0709   REF   6  LAST 1248    13,3166   01511 C                    VRECT
```

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0710                                13,3167   57576 1                    0,2
0711                                13,3170   63325 C          PDDL      PDVL          VATT TO PD6    TAT TO PD12
0712  REF  14  LAST 1283           13,3171   01517 C                     TET
0713  REF  10  LAST 1286           13,3172   01503 C                     RRECT
0714                                13,3173   64715 C          PDVL      PDDL*
0715  REF   7  LAST 1286           13,3174   01511 C                     VRECT
0716  REF   2  LAST  478           13,3175   50044 1                     MUEARTH,2
0717                                13,3176   76006 C          PUSH      AXT,1
0718                                13,3177   77765 C          DEC       -10
0719                                13,3200   76014 C          BON       AXT,1
0720  REF  18  LAST 1285           13,3201   00303 1                     MOONFLAG
0721                                13,3202   27204 1                     +2
0722                                13,3203   77775 1          DEC       -2
0723                                13,3204   40001 1  INTEXIT SETPD      BOV
0724                                13,3205   00001 0                     0
0725                                13,3206   27207 1                     +1
07251                               13,3207   43014 C          CLEAR     CLEAR
07252 REF   2  LAST  282           13,3210   04676 1                     AVEMIDSW      ALLOW UPDATE OF DOWNLINK STATE VECTOR
07253 REF   5  LAST 1285           13,3211   01667 1                     PRECIFLG
0726                                13,3212   77535 1          SLOAD     EXIT
0727  REF   8  LAST 1286           13,3213   02215 C                     IRETURN
0728  REF 654  LAST 1269           13,3214  3 0154 1          CA        MPAC
0729  REF  38  LAST 1253           13,3215   50 120 1          INDEX     FIXLOC
0730  REF  23  LAST 1286           13,3216   54 052 1          TS        QPRET
0731  REF   4  LAST 1227           13,3217  0 3406 C          TC        INTWAKE
R0732 RVCON SETS UP ORBIT INTEGRATION TO DO A CONIC SOLUTION FOR POSITION AND
R0733 VELOCITY FOR THE INTERVAL (TET-TDEC)

0734                                13,3220   45345 1  RVCON    DLOAD     DSU
0735  REF   3  LAST 1286           13,3221   01101 C                     TDEC
0736  REF  15  LAST 1287           13,3222   01517 C                     TET
0737  REF   7  LAST 1245           13,3223   36312 1          STCALL    TAU*
0738  REF   4  LAST 1286           13,3224   23344 C                     RECTIFY
0739                                13,3225   77624 1          CALL
0740  REF   1                       13,3226   22310 0                     KEPPREP
0741                                13,3227   43345 1          DLOAD     DAD
0742  REF   8  LAST 1248           13,3230   01551 1                     TC
0743  REF  16  LAST 1287           13,3231   01517 C                     TET
0744  REF  17  LAST 1287           13,3232   35517 1          STCALL    TET
0745  REF   2  LAST 1286           13,3233   27157 1                     RECTCUT
```

P07459 TESTLOOP

0746			13,3234	43014 C	TESTLOOP	BOF	CLRGO	
07462	REF 4	LAST 1280	13,3235	04752 C			QUITFLAG	
07463			13,3236	27241 C			+3	
07464	REF 6	LAST 1286	13,3237	01632 1			STATEFLG	
07465	REF 1		13,3240	27204 1			INTEXIT	STOP INTEGRATION
07466			13,3241	73001 1	+3	SETPD	LXA,2	
0747			13,3242	00013 C			10D	
0748	REF 9	LAST 1285	13,3243	02150 1			PBODY	
0749			13,3244	51575 1		VLOAD	ABVAL	
0750	REF 17	LAST 1283	13,3245	01535 C			RCV	
0751			13,3246	43006 C		PUSH	CLEAR	RC TO 10D
0752	REF 1		13,3247	00262 1			MIDFLAG	
0753			13,3250	50023 C		DSU*	BMN	MIDFLAG=0 IF R G.T. RMP
0754	REF 1		13,3251	67241 1			RME,2	
0755			13,3252	27255 C			+3	
0756			13,3253	77614 1		SET		
0757	REF 2	LAST 1288	13,3254	00062 C			MIDFLAG	
0758			13,3255	41345 C	NORFINAL	DLOAD	DMP	
0759			13,3256	00013 C			10D	
0760			13,3257	00043 C			34D	
0761			13,3260	55762 1		SR1R	DDV*	
0762	REF 3	LAST 1287	13,3261	50044 1			MUEARTH,2	
0763			13,3262	41366 1		SQRT	DMP	
0764	REF 1		13,3263	23675 1			.3D	
0765			13,3264	40442 1		SR3	SR4	DT IS TRUNCATED TO A MULTIPLE
0766			13,3265	54345 1		DLOAD	SL	
0767	REF 655	LAST 1287	13,3266	00155 C			MPAC	
0768			13,3267	20220 0			15D	OF 128 CSECS.
0769			13,3270	40006 C		PUSH	BOV	
0770	REF 1		13,3271	27316 C			MAXDT	
0771			13,3272	50021 1		BDSU	BMN	
0772	REF 1		13,3273	27370 C			DT/2MAX	
0773	REF 2	LAST 1288	13,3274	27316 C			MAXDT	
0774			13,3275	45345 1	DT/2COMP	DLOAD	DSU	
0775	REF 4	LAST 1287	13,3276	01101 C			TDEC	
0776	REF 18	LAST 1287	13,3277	01517 C			TET	
0777			13,3300	54234 0		RTB	SL	
0778	REF 4	LAST 712	13,3301	45541 C			SGNAGREE	
0779			13,3302	20211 1			8D	
0780	REF 2	LAST 87	13,3303	02314 C		STORE	DT/2	B-19
0781			13,3304	51400 1		BOV	ABS	
0782	REF 1		13,3305	27322 1			GETMAXDT	
0783			13,3306	50025 C		DSU	BMN	IS TIME TO INTEG. TO GR THAN MAXTIME
0784			13,3307	00015 C			12D	
0785	REF 1		13,3310	27326 C			POOHCHK	
0786			13,3311	75345 1	USEMAXDT	DLOAD	SIGN	
0787			13,3312	00015 C			12D	
0788	REF 3	LAST 1288	13,3313	02314 C			DT/2	

L INTEGRATION INITIALIZATION USER'S PAGE NO. 15 E3 S3

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0789  REF   4 LAST 1288  13,3314  36314 1          STCALL DT/2
0790  REF   2 LAST 1288  13,3315  27326 0                 POOHCHK
0791                      13,3316  65345 0  MAXDT   DLOAD  PDDL          EXCHANGE DT/2MAX WITH COMPUTED MAX.
0792  REF   2 LAST 1288  13,3317  27370 0                 DT/2MAX
0793                      13,3320  77650 1          GOTO
0794  REF   1             13,3321  27275 1                 DT/2CCMP
0795                      13,3322  77634 0  GETMAXDT RTB
0796  REF  19 LAST  823   13,3323  45707 0                 SIGNMPAC
0797  REF   5 LAST 1289   13,3324  36314 1          STCALL DT/2
0798  REF   1             13,3325  27311 1                 USEMAXDT
0799                      13,3326  51545 1  POOHCHK  DLOAD  ABS
0800  REF   6 LAST 1289   13,3327  02314 0                 DT/2
0801                      13,3330  50025 0          DSU     BMN
0802  REF   1             13,3331  27366 1                 DT/2MIN
0803  REF   2 LAST 1283   13,3332  27136 0                 A-PCHK
0804                      13,3333  46135 1          SLOAD   BHIZ
0805  REF  13 LAST  708   13,3334  01012 0                 MODREG
0806                      13,3335  27340 0                 +3
0807                      13,3336  77650 1          GOTO
0808  REF   1             13,3337  23155 1                 TIMESTEP
08081                     13,3340  77614 1          BON                    WAS THIS CALL VIA CSM(LEM)PREC
08082 REF   6 LAST 1287   13,3341  01707 0                 PRECIFLG
08083 REF   2 LAST 1289   13,3342  23155 1                 TIMESTEP       YES
0809                      13,3343  45345 1          DLOAD   DSU
0810  REF   7 LAST 1289   13,3344  02314 0                 DT/2
0811                      13,3345  00015 0                 12D
0812                      13,3346  43040 1          BMN     BOFCLR
0813  REF   3 LAST 1289   13,3347  27136 0                 A-PCHK
0814  REF   3 LAST 1286   13,3350  04242 1                 NEWIFLG
0815  REF   3 LAST 1289   13,3351  23155 1                 TIMESTEP
0816                      13,3352  45345 1          DLOAD   DSU
0817  REF   5 LAST 1288   13,3353  01101 0                 TDEC
0818  REF  19 LAST 1288   13,3354  01517 0                 TET
08181                     13,3355  77640 0          BMN                    NO BACKWARD INTEGRATION
08182 REF   2 LAST 1288   13,3356  27204 1                 INTEXIT
0819                      13,3357  40525 1          PDDL    SR4
0820  REF   8 LAST 1289   13,3360  02314 0                 DT/2           IS 4(DT) LS(TDEC - TET)
0821                      13,3361  44322 1          SR2R    BDSU           NO
0822                      13,3362  52040 1          BMN     GOTO
0823  REF   3 LAST 1289   13,3363  27204 1                 INTEXIT
0824  REF   4 LAST 1289   13,3364  23155 1                 TIMESTEP
0825                      13,3365  00000 1  DT/2MIN  2DEC    3 B-20
0825                      13,3366  01400 1
0826                      13,3367  14152 1  DT/2MAX  2DEC    4000 E2 B-20
0826                      13,3370  00000 1
0828                      13,3371  77776 1  INTSTALL EXIT
0829  REF 246 LAST 1223   13,3372  3 4714 1                CAF     ZERO
0830  REF 207 LAST 1198   13,3373  54 001 1 ALLSTALL TS     L
0831  REF   5 LAST  183   13,3374  3 0106 0                CA      RASFLAG
0832  REF 208 LAST 1289   13,3375  50 001 0                INDEX   L
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```
0833   REF   1                 13,3376  7 3467 C          MASK    INTBITAB        IS THIS STALL AREA FREE
0834                           13,3377  0 0006 1          EXTEND
0835   REF   1                 13,3400  1 3445 C          BZF     OKTOGRAB        YES
0836   REF 209  LAST 1289      13,3401  50 001 C          INDEX   L
0837   REF   1                 13,3402  3 3464 1          CAF     WAKESTAL
0838   REF   4  LAST  415      13,3403  0 5070 C          TC      JOBSLEEP
0839                           13,3404   77776 1  INTWAKE0 EXIT
08395  REF   2  LAST  502      13,3405  1 3426 C          TCF     INTWAKE1

0840   REF   6  LAST 1289      13,3406  4 0106 1  INTWAKE CS      RASFLAG         IS THIS INTSTALLED ROUTINE TO BE
0841   REF   1                 13,3407  7 4704 1          MASK    REINTBIT              RESTARTED
0842   REF 336  LAST 1196      13,3410  10 000 C          CCS     A
0843   REF   3  LAST 1290      13,3411  0 3426 1          TC      INTWAKE1        NO

0844   REF  39  LAST 1287      13,3412  50 120 1          INDEX   FIXLOC
0845   REF  24  LAST 1287      13,3413  3 0052 C          CA      QPRET
0848   REF   1                 13,3414  55*055 1          TS      TBASE2          YES, DONT RESTART WITH SOMEONE ELSES Q

0849   REF  97  LAST 1286      13,3415  0 5301 C          TC      PHASCHNG
0850                           13,3416   04022 C          OCT     04022

0851   REF   2  LAST 1290      13,3417  3 1055 C          CA      TBASE2
0852   REF  40  LAST 1290      13,3420  50 120 1          INDEX   FIXLOC
0853   REF  25  LAST 1290      13,3421  54 052 1          TS      QPRET
0854   REF   2  LAST 1290      13,3422  3 4704 C          CAF     REINTBIT
0855   REF   7  LAST 1290      13,3423  7 0106 1          MASK    RASFLAG
0856                           13,3424  0 0006 1          EXTEND
0857   REF   1                 13,3425  1 3450 1          BZF     GOBAC           DONT INTWAKE IF WE CAME HERE VIA RESTART

0858   REF 247  LAST 1289      13,3426  3 4714 1  INTWAKE1 CAF     ZERO
0859   REF   1                 13,3427  54 154 C  WAKE    TS      STALTEM         INDEX OF ANY STALL USER
0860   REF   2  LAST 1290      13,3430  50 154 1  WAKE1   INDEX   STALTEM
0861   REF   2  LAST 1290      13,3431  3 3464 1          CAF     WAKESTAL
0862                           13,3432  0 0004 C          INHINT
0863   REF   5  LAST  419      13,3433  0 5074 1          TC      JOBWAKE
0864   REF  22  LAST 1183      13,3434  10 064 1          CCS     LOCCTR
0865   REF   1                 13,3435  1 3430 1          TCF     WAKE1           MAY BE MORE TO WAKE UP
0866                           13,3436   00051 C  FORTYONE DEC     41
0867   REF   3  LAST 1290      13,3437  50 154 1          INDEX   STALTEM
0868   REF   2  LAST 1290      13,3440  4 3467 C          CS      INTBITAB
0869   REF   8  LAST 1290      13,3441  7 0106 1          MASK    RASFLAG
0870   REF   9  LAST 1290      13,3442  54 106 1          TS      RASFLAG         RELEASE STALL AREA
0871                           13,3443  0 0003 1          RELINT
0872   REF   2  LAST 1290      13,3444  1 3450 1          TCF     GOBAC
0873   REF 210  LAST 1290      13,3445  50 001 C  OKTOGRAB INDEX   L               NO, WAIT UNTIL AVAILABLE
0874   REF   2  LAST  182      13,3446  3 4675 1          CAF     INTFLBIT
0875   REF  10  LAST 1290      13,3447  26 106 1          ADS     RASFLAG
0876   REF 236  LAST 1286      13,3450  0 6006 1  GOBAC   TC      INTPRET
0877                           13,3451   77616 C          RVQ
```

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0878                                13,3452   77776 1  ERASTAL1 EXIT
0879   REF 154  LAST 1253           13,3453  3 4712 1           CAF    ONE
0880   REF   1                     13,3454  1 3373 1           TCF    ALLSTALL
0881                                13,3455   77776 1  ERASTAL2 EXIT
0882   REF  66  LAST 1201           13,3456  3 4711 1           CAF    TWO
0883   REF   2  LAST 1291           13,3457  1 3373 1           TCF    ALLSTALL
0884   REF 155  LAST 1291           13,3460  3 4712 1  ERASWAK1 CAF    ONE
0885   REF   1                     13,3461  1 3427 1           TCF    WAKE
0886   REF  67  LAST 1291           13,3462  3 4711 1  ERASWAK2 CAF    TWO
0887   REF   2  LAST 1291           13,3463  1 3427 1           TCF    WAKE
0888   REF  27  LAST 1285           13,3464   27372 1  WAKESTAL CADR   INTSTALL +1
0889   REF   1                     13,3465   27453 C           CADR   ERASTAL1 +1
0890   REF   1                     13,3466   27456 C           CADR   ERASTAL2 +1
0891   REF 656  LAST 1288              0154            STALTEM EQUALS MPAC
0892                                13,3467   20100 1  INTBITAB OCT    20100
0893                                13,3470   10040 1           OCT    10040
0894                                13,3471   04020 1           OCT    04020
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P0895 AVETOMID

R0896 THIS ROUTINE PERFORMS THE TRANSITION FROM A THRUSTING PHASE TO THE COAST
R0897 PHASE BY INITIALIZING THIS VEHICLES PERMANENT STATE VECTOR WITH THE
R0898 VALUES LEFT BY THE AVERAGEG ROUTINE IN RN,VN,PIPTIME.

R0899 BEFORE THIS IS DONE THE W-MATRIX, IF ITS VALID (ORWFLAG OR RENDWFLG IS
R0900 SET) IS INTEGRATED FORWARD TO PIPTIME WITH THE PRE-THRUST STATE VECTOR.

R0901 IN ADDITION, THE OTHER VEHICLE IS INTEGRATED (PERMANENT) TO PIPTIME.

R0902 FINALLY TRKMKCNT IS ZEROED

0903	REF 3	LAST 1279	13,2000				SETLOC	INTINIT	
0904			13,3472				BANK		
0905	REF 3	LAST 1279 TO 1292:	457	487*			COUNT*	$$/INTIN	
0906			13,3472	43020	1	AVETOMID	STQ	BON	
0907	REF 14	LAST 1227	13,3473	02317	0			EGRESS	
0908	REF 10	LAST 622	13,3474	02716	0			RENDWFLG	
0909	REF 1		13,3475	27545	0			INT/W	W-MATRIX VALID ,GO INTEGRATE IT
0910			13,3476	77614	1		BON		
0911	REF 11	LAST 621	13,3477	01711	1			ORBWFLAG	
0912	REF 2	LAST 1292	13,3500	27545	0			INT/W	W-MATRIX VALID ,GO INTEGRATE IT
0913			13,3501	45145	0	OTHERS	DLOAD	CALL	GET SET FOR OTHER VEHICLE INTEGRATION
0914	REF 16	LAST 1036	13,3502	01205	1			PIPTIME	DESIRED TIME
0915	REF 28	LAST 1291	13,3503	27371	1			INTSTALL	
0916			13,3504	45014	0		SET	CALL	
0917	REF 16	LAST 1286	13,3505	01474	1			VINTFLAG	CM
0918	REF 3	LAST 1280	13,3506	26621	0			SETIFLGS	SETS UP NONE W-MAT. PERMANENT INTEG.
0919			13,3507	43014	0		BOF	CLEAR	
0920	REF 3	LAST 483	13,3510	02747	1			COMPUTER	
0921			13,3511	27513	0			+2	COMPUTER IS LM ,INTEG CM
0922	REF 17	LAST 1292	13,3512	01674	0			VINTFLAG	COMPUTER IS CM ,INTEG LM
0923	REF 51	LAST 1286	13,3513	34041	0		STCALL	TDEC1	
0924	REF 11	LAST 1283	13,3514	27113	1			INTEGRV	
0925			13,3515	45174	1		AXT,2	CALL	NOW MOVE PROPERLY SCALE RN,VN AS WELL AS
0926			13,3516	00002	0			2	PIPTIME TO INTEGRATION ERASABLES.
0927	REF 29	LAST 1292	13,3517	27371	1			INTSTALL	
0928			13,3520	77014	1		BON	AXT,2	
0929	REF 9	LAST 1226	13,3521	04303	0			MOONTHIS	
0930			13,3522	27524	1			+2	
0931			13,3523	00000	1			0	
0932			13,3524	53775	1		VLOAD	VSR*	
0933	REF 18	LAST 787	13,3525	01171	1			RN	
0934			13,3526	57176	0			0,2	
0935	REF 11	LAST 1287	13,3527	01503	0		STORE	RREC1	

```
0936  REF  18  LAST 1288   13,3530  15535 C          STODL  RCV
0937  REF  17  LAST 1292   13,3531  01205 1                 PIPTIME
0938  REF  20  LAST 1289   13,3532  25517 C          STOVL  TET
0939  REF  18  LAST  838   13,3533  01177 1                 VN
0940                       13,3534  45057 1          VSR*   CALL
0941                       13,3535  57176 C                 0,2
0942  REF   2  LAST  501   13,3536  23360 C                 MINIRECT      FINISH SETTING UP STATE VECTOR
0943                       13,3537  66234 1          RTB    SSP
0944  REF   1             13,3540  26651 1                 MOVATHIS      PUT TEMP STATE VECTOR INTO PERMANENT
0945  REF   8  LAST  847   13,3541  01127 1                 TRKMKCNT
0946                       13,3542  00000 1                 0
0947                       13,3543  77650 1          GOTO
0948  REF   2  LAST 1227   13,3544  75743 C                 FAZAB5

0949                       13,3545  45145 C  INT/W  DLOAD  CALL
0950  REF  18  LAST 1293   13,3546  01205 1                 PIPTIME       INTEGRATE W THRU BURN
0951  REF  30  LAST 1292   13,3547  27371 1                 INTSTALL
0952                       13,3550  43014 C          SET    SET
0953  REF  15  LAST 1285   13,3551  01476 C                 DIMOFLAG      DO W-MATRIX
0954  REF   3  LAST 1287   13,3552  04476 C                 AVEMIDSW      SO WONT CLOBBER RN,VN,PIPTIME
0955                       13,3553  43014 C          SET    CLEAR
0956  REF   6  LAST 1280   13,3554  01475 C                 D6OR9FLG      9X9 FOR LM
0957  REF  18  LAST 1292   13,3555  01674 C                 VINTFLAG      LM
0958                       13,3556  43014 C          BOF    SET
0959  REF   4  LAST 1292   13,3557  02747 1                 COMPUTER
0960                       13,3560  27564 C                 +4            LM TO DO
0961  REF  19  LAST 1293   13,3561  01474 1                 VINTFLAG
0962                       13,3562  77614 1          CLEAR
0963  REF   7  LAST 1293   13,3563  01675 1                 D6OR9FLG      6X6 FOR CM
0964  REF  52  LAST 1292   13,3564  34041 C          STCALL TDEC1
0965  REF  12  LAST 1292   13,3565  27113 1                 INTEGRV
0966                       13,3566  77650 1          GOTO
0967  REF   1             13,3567  27501 C                 OTHERS        NOW GO DO THE OTHER VEHICLE
```

R0968 MIDTOAV1

R0969 THIS ROUTINE INTEGRATES (PRECISION) TO THE TIME SPECIFIED IN TDEC1.
R0970 IF, AT THE END OF AN INTEGRATION TIME STEP, CURRENT TIME PLUS A DELTA
R0971 TIME (SEE TIMEDELT.....BASED ON THE COMPUTATION TIME FOR ONE TIME STEP)
R0972 IS GREATER THAN THE DESIRED TIME, ALARM 1703 IS SET AND THE INTEGRATION
R0973 IS DONE TO THE CURRENT TIME.
R0974 RETURN IS IN BASIC TO THE RETURN ADDRESS PLUS ONE.

R0975 IF THE INTEGRATION IS FINISHED TO THE DESIRED TIME, RETURN IS IN BASIC
R0976 TO THE RETURN ADDRESS

R0977 IN EITHER CASE , BEFORE RETURNING, THE EXTRAPOLATED STATE VECTOR IS TRAN
R0978 FERRED FROM R,VAT1 TO R,VN1-PIPTIME1 IS SET TO THE FINISHING INTEGRA-
R0979 TION TIME AND MPAC IS SET TO THE DELTA TIME---
R0980 TAT MINUS CURRENT TIME.

R0981 MIDTOAV2

R0982 THIS ROUTINE INTEGRATES THIS VEHICLES STATE VECTOR TO THE CURRENT TIME.
R0983 NO INPUTS ARE REQUIRED OF THE CALLER. RETURN IS IN BASIC TO THE RETURN
R0984 ADDRESS WITH THE ABOVE TRANSFERS TO R,VN1-PIPTIME1-AND MPAC DONE

```
0985   REF   2  LAST   79      1127                          EBANK= IRETURN1
0986                          13,3570   43020 1  MIDTOAV2 STQ    CLRGO    INTEGRATE TO PRESENT TIME PLUS TIMEDELT
0987   REF   3  LAST 1294     13,3571   01127 1                   IRETURN1
0988   REF   1                13,3572   04634 1                   MID1FLAG
0989   REF   1                13,3573   27607 0                   ENTMID2

0990                          13,3574   43020 1  MIDTOAV1 STQ    SET      INTEGRATE TO TDEC1
0991   REF   4  LAST 1294     13,3575   01127 1                   IRETURN1
0992   REF   2  LAST 1294     13,3576   04474 1                   MID1FLAG
0993                          13,3577   43234 0           RTB     DAD      INITIAL CHECK, IS TDEC1 IN THE FUTURE
0994   REF  27  LAST 1279     13,3600   45505 0                   LOADTIME
0995   REF   1                13,3601   27711 0                   TIMEDELT
0996                          13,3602   51021 0           BDSU    BPL
0997   REF  53  LAST 1293     13,3603   00041 1                   TDEC1
0998   REF   1                13,3604   27613 0                   ENTMID1  Y5S
0999                          13,3605   77624 1           CALL
1000   REF   1                13,3606   27677 1                   NOTIME   NO, SET ALARM, SWITCH TO MIDTOAV2

1001                          13,3607   43234 0  ENTMID2  RTB     DAD
1002   REF  28  LAST 1294     13,3610   45505 0                   LOADTIME
1003   REF   2  LAST 1294     13,3611   27711 0                   TIMEDELT
1004   REF  54  LAST 1294     13,3612   00041 1           STORE   TDEC1

1005                          13,3613   77624 1  ENTMID1  CALL
1006   REF  31  LAST 1293     13,3614   27371 1                   INTSTALL
1007                          13,3615   45014 0           CLEAR   CALL
```

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```
1008  REF  16  LAST 1293   13,3616   01676 1                DIMOFLAG      NO W-MATRIX
1009  REF   1              13,3617   26034 1                THISVINT
1010                       13,3620   43014 0   CLEAR        SET
1011  REF  17  LAST 1286   13,3621   01673 1                INTYPFLG
1012  REF   1              13,3622   04475 0                MIDAVFLG      LET INTEG. KNOW THE CALL IS FOR MIDTOAV.
1013                       13,3623   77624 1   CALL
1014  REF  13  LAST 1293   13,3624   27113 1                INTEGRV       GO INTEGRATE
1015                       13,3625   77214 0   CLEAR        VLOAD
1016  REF   2  LAST 1295   13,3626   04675 1                MIDAVFLG
1017  REF  37  LAST  884   13,3627   00001 0                RATT
1018  REF   9  LAST  787   13,3630   25232 0   STOVL        RN1
1019  REF  24  LAST  866   13,3631   00007 0                VATT
1020  REF   4  LAST  787   13,3632   15240 0   STODL        VN1
1021  REF  11  LAST  886   13,3633   00015 0                TAT
1022  REF   8  LAST  783   13,3634   01246 0   STORE        PIPTIME1
10221                      13,3635   66134 1   SXA,2        SXA,1
10222 REF  15  LAST  786   13,3636   03746 1                RTX2
10223 REF  11  LAST  665   13,3637   03745 1                RTX1
1023                       13,3640   77776 1   EXIT

1024                       13,3641   0 0004 0  INHINT
1025                       13,3642   0 0006 1  EXTEND
1026  REF  28  LAST 1063   13,3643   4 0025 1  DCS          TIME2
1027  REF 657  LAST 1291   13,3644   20 155 1  DAS          MPAC
1028  REF  10  LAST 1129   13,3645   0 7226 0  TC           TPAGREE

1029  REF   5  LAST 1294   13,3646   3 1127 1  CA           IRETURN1
1030  REF   7  LAST  563   13,3647   0 4577 0  TC           BANKJUMP
1031                       13,3650   47014 1   CKMID2   BOF  RTB
1032  REF   3  LAST 1294   13,3651   04754 0                MID1FLAG
1033  REF   1              13,3652   27667 0                MID2
1034  REF  29  LAST 1294   13,3653   45505 0                LOADTIME
1035                       13,3654   44215 1   DAD          BDSU
1036  REF   3  LAST 1294   13,3655   27711 0                TIMEDELT
1037  REF   6  LAST 1289   13,3656   01101 0                TDEC
1038                       13,3657   45044 0   BPL          CALL
1039  REF   2  LAST 1286   13,3660   27234 1                TESTLOOP      YES
1040  REF   2  LAST 1294   13,3661   27677 1                NOTIME

1041                       13,3662   43234 0   TIMEINC  RTB  DAD
1042  REF  30  LAST 1295   13,3663   45505 0                LOADTIME
1043  REF   4  LAST 1295   13,3664   27711 0                TIMEDELT
1044  REF   7  LAST 1295   13,3665   35101 1   STCALL       TDEC
1045  REF   3  LAST 1295   13,3666   27234 1                TESTLOOP

1046                       13,3667   45345 1   MID2     DLOAD DSU
1047  REF   8  LAST 1295   13,3670   01101 0                TDEC
1048  REF  21  LAST 1293   13,3671   01517 0                TET
1049                       13,3672   45246 0   ABS          DSU
1050  REF   1              13,3673   27707 1                3CSECS
```

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```
1051                          13,3674   52040 1          BMN     GOTC
1052  REF   4  LAST 1289     13,3675   27136 0          A-PCHK
1053  REF   1                 13,3676   27662 0          TIMEINC

1054                          13,3677   77414 0  NOTIME  CLEAR   EXIT          TOO LATE
1055  REF   4  LAST 1295     13,3700   04674 0          MID1FLAG
1056  REF   6  LAST 1295     13,3701   25'127 1         INCR    IRETURN1      SET ERROR EXIT  (CALLOC +2)
1057  REF  33  LAST  779     13,3702   0 5537 0         TC      ALARM         INSUFFICIENT TIME FOR INTEGRATION --
1058                          13,3703    01703 1         OCT     1703             TIG WILL BE SLIPPED...
1059  REF 237  LAST 1290      13,3704   0 6006 1         TC      INTPRET
1060                          13,3705    77616 0         RVQ

1061                          13,3706    00000 1  3CSECS  2DEC    3
1061                          13,3707    00003 1
1062                          13,3710    00000 1  TIMEDELT 2DEC   1000
1062                          13,3711    01750 1
1063                          27,2633              BANK    27
1064  REF   1                 27,2000              SETLOC  UPDATE2
1065                          27,2633              BANK
1066  REF   1                   0330               EBANK=  INTWAKUQ


1067  REF   1                                      COUNT*  $$/INTIN

1068  REF   1                   0330       INTWAKUQ =      INTWAKIQ      TEMPORARY UNTIL NAME OF INTWAKIQ IS CHNG

1069                          27,2633   0 0003 1 INTWAKEU RELINT
1070                          27,2634   0 0006 1         EXTEND
1071  REF   2  LAST 1296     27,2635   22 330 1         QXCH    INTWAKUQ      SAVE Q FOR RETURN

1072  REF 238  LAST 1296      27,2636   0 6006 1         TC      INTPRET

1073                          27,2637   53135 0          SLOAD   BZE           IS THIS A CSM/LEM STATE VECTOR UPDATE
1074  REF   3  LAST  178     27,2640    01502 1         UPSVFLAG              REQUEST. IF NOT GO TO INTWAKUP.
1075  REF   1                 27,2641   56700 0          INTWAKUP

1076                          27,2642    77775 1         VLOAD                 MOVE RRECT(6) AND VRECT(6) INTO
1077  REF  12  LAST 1292      27,2643    01503 0         RRECT                      RCV(6)   AND VCV(6)   RESPECTIVELY.
1078  REF  19  LAST 1293      27,2644    25535 0         STOVL   RCV
1079  REF   8  LAST 1287      27,2645    01511 0         VRECT                 NOW GO TO 'RECTIFY +13D' TO
1080                          27,2646    77624 1         CALL                  STORE VRECT INTO VCV  AND ZERO OUT
1081  REF   5  LAST 1287      27,2647    23361 1         RECTIFY +13D          TDELTAV(6),TNUV(6),TC(2) AND XKEP(2)
1082                          27,2650    51535 0         SLOAD   ABS           COMPARE ABSOLUTE VALUE OF 'UPSVFLAG'
1083  REF   4  LAST 1296      27,2651    01502 1         UPSVFLAG              TO 'UPDATE MOON STATE VECTOR CODE'
1084                          27,2652    53025 0         DSU     BZE           TO DETERMINE WHETHER THE STATE VECTOR TO
1085  REF   1                 27,2653    16711 1         UPMNSVCD              BE UPDATED IS IN THE EARTH OR LUNAR
1086  REF   1                 27,2654    56661 0         INTWAKEM              SPHERE OF INFLUENCE.........
1087                          27,2655    43174 1         AXT,2   CLRGO         EARTH SPHERE OF INFLUENCE.
1088                          27,2656    00000 1         DEC     0
1089  REF  19  LAST 1287      27,2657    00223 1         MOONFLAG
```

```
1090  REF   1                27,2660   56664 C                    INTWAKEC
1091                         27,2661   43174 1  INTWAKEM AXT,2    SET       LUNAR SPHERE OF INFLUENCE.
1092                         27,2662   00002 C           DEC      2
1093  REF  20  LAST 1296    27,2663   00063 1                    MOONFLAG
1094                         27,2664   50135 C  INTWAKEC SLOAD    BMN       COMMON CODING AFTER X2 INITIALIZED AND
A1095                                                                       MOONFLAG SET(OR CLEARED).
1096  REF   5  LAST 1296    27,2665   01502 1                    UPSVFLAG  IS THIS A REQUEST FOR A LEM OR CSM
1097  REF   1                27,2666   56674 1                    INTWAKLM   STATE VECTOR UPDATE.....
1098                         27,2667   77624 1           CALL               UPDATE CSM STATE VECTOR
1099  REF   3  LAST 1286    27,2670   26636 C                    ATOPCSM

1100                         27,2671   52014 C           CLEAR    GOTO
1101  REF  12  LAST 1292    27,2672   01671 C                    ORBWFLAG
1102  REF   1                27,2673   56676 C                    INTWAKEX

1103                         27,2674   77624 1  INTWAKLM CALL               UPDATE  LM STATE VECTOR
1104  REF   3  LAST 1286    27,2675   26711 1                    ATOPLEM

1105                         27,2676   77614 1  INTWAKEX CLEAR
1106  REF  11  LAST 1292    27,2677   02676 1                    RENDWFLG

1107                         27,2700   45131 C  INTWAKUP SSP      CALL      REMOVE :UPDATE STATE VECTOR INDICATOR:
1108  REF   6  LAST 1297    27,2701   01502 1                    UPSVFLAG
1109                         27,2702   00000 1                    0
1110  REF   2  LAST  633    27,2703   27404 1                    INTWAKEO  RELEASE :GRAB: OF ORBIT INTEG
1111                         27,2704   77776 1           EXIT

1112  REF  98  LAST 1290    27,2705   0 5301 C          TC       PHASCHNG
1113                         27,2706    04026 1          OCT      04026
1114  REF   3  LAST 1296    27,2707   0 0330 1          TC       INTWAKUO

1115                         27,2710    00002 C  UPMNSVCO OCT     2
1116                         27,2711    00000 1          OCT      0


1117                         27,2712    77420 1  GRP2PC   STQ      EXIT
1118  REF   3  LAST  119    27,2713    03536 1                    GRP2SVQ
1119  REF  99  LAST 1297    27,2714   0 5301 C          TC       PHASCHNG
1120                         27,2715    04022 C          OCT      04022
1121  REF 239  LAST 1296    27,2716   0 6006 1          TC       INTPRET
1122                         27,2717    77650 1          GOTO
1123  REF   4  LAST 1297    27,2720    03536 1                    GRP2SVQ
```

L ORBITAL INTEGRATION

```
R0001            DELETE
 0002                        13,3712                 BANK   13
 0003  REF   1               11,2000                 SETLOC ORBITAL
 0004                        11,2310                 BANK
 0005  REF   1                                       COUNT  11/ORBIT
R0006            DELETE
 0007                        11,2310  40354 1 KEPPREP LXA,2  SETPD
 0008  REF  10  LAST 1288    11,2311  02150 1         PBODY
 0009                        11,2312  00001 C         0
 0010                        11,2313  75543 1         DLOAD* SQRT          SQRT(MU) (+18 OR +15)  0D        PL  2D
 0011  REF   4  LAST 1288    11,2314  50044 1         MUEARTH,2
 0012                        11,2315  53515 C         PDVL   UNIT                                          PL  6D
 0013  REF  20  LAST 1296    11,2316  01535 C         RCV
 0014                        11,2317  60325 C         PDDL   NORM          NORM R (+29 OR +27 - N1) 2D     PL  4D
 0015                        11,2320  00045 C         36D
 0016  REF  64  LAST 1284    11,2321  00047 1         X1
 0017                        11,2322  77715 1         PDVL
 0018                        11,2323  65241 C         DOT    PDDL          F*SQRT(MU)(+7 OR+5) 4D          PL  6D
 0019  REF  15  LAST 1283    11,2324  01543 1         VCV
 0020  REF   8  LAST 1287    11,2325  02312 C         TAU.   (+28)
 0021                        11,2326  60225 1         DSU    NORM
 0022  REF   9  LAST 1287    11,2327  01551 1         TC
 0023  REF  44  LAST 1225    11,2330  00051 C         S1
 0024                        11,2331  77742 C         SR1
 0025                        11,2332  65271 C         DDV    PDDL
 0026                        11,2333  00003 1         2D
 0027                        11,2334  41405 C         DMP    PUSH          FS(+6 +N1-N2) 6D                PL  8D
 0028                        11,2335  00005 1         4D
 0029                        11,2336  65316 C         DSQ    PDDL          (FS)SQ(+12 +2(N1-N2)) 8D        PL 10D
 0030                        11,2337  00005 1         4D
 0031                        11,2340  64716 C         DSQ    PDDL*         SSQ/MU(-20R +2(N1-N2)) 10D       PL 12D
 0032  REF   5  LAST 1298    11,2341  50044 1         MUEARTH,2
 0033                        11,2342  40442 1         SR3    SR4
 0034                        11,2343  47515 C         PDVL   VSQ           PREALIGN MU (+43 OR +37) 12D    PL 14D
 0035  REF  16  LAST 1298    11,2344  01543 1         VCV
 0036                        11,2345  44205 C         DMP    BDSU                                         PL 12D
 0037                        11,2346  00045 C         36D
 0038                        11,2347  41271 C         DDV    DMP                                          PL 10D
 0039                        11,2350  00003 1         2D     -(1/R-ALPHA)(+12 +3N1-2N2)
 0040                        11,2351  53605 1         DMP    SL*
 0041  REF   1               11,2352  23717 1         DP2/3
 0042                        11,2353  20176 C         0 -3,1 1CL(1/R-ALPHA)(+13 +2(N1-N2))
 0043                        11,2354  43260 1         XSU,1  DAD           2(FS)SQ - ETCETRA        PL 8D
 0044  REF  45  LAST 1298    11,2355  00050 1         S1     X1 = N2-N1
 0045                        11,2356  45257 C         SL*    DSU           -FS+2(FS)SQ ETC (+6 +N1-N2)     PL  6D
 0046                        11,2357  20211 1         8D,1
 0047                        11,2360  41205 C         DMP    DMP
 0048                        11,2361  00001 0         0D
 0049                        11,2362  00005 1         4D
 0050                        11,2363  53657 0         SL*    SL*
```

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```
0051                                11,2364  20211 1          BD,1
0052                                11,2365  20201 C          0,1          S(-FS(1-2FS)-1/6...)(+17 OR +16)
0053                                11,2366  65215 1    DAD   PDDL                                      PL  6D
0054  REF  2  LAST  93              11,2367  01553 C          XKEP
0055                                11,2370  53605 1    DMP   SL*          S(+17 OR +16)
0056                                11,2371  00001 C          0D
0057                                11,2372  20202 C          1,1
0058                                11,2373  43204 C    BOVB  DAD
0059  REF  9  LAST 1226             11,2374  57314 C          TCDANZIG
0060                                11,2375  77626 C    STADR
0061  REF  4  LAST 1247             11,2376  75471 1    STORE XKEPNEW
0062                                11,2377  74020 C    STQ   AXC,1
0063  REF  3  LAST 1249             11,2400  02270 C          KEPRTN
0064                                11,2401  00012 1    DEC   10
0065                                11,2402  74014 1    BON   AXC,1
0066  REF 21  LAST 1297             11,2403  00303 1          MOONFLAG
0067  REF  1                        11,2404  24000 1          KEPLERN
0068                                11,2405  00002 C    DEC   2
0069                                11,2406  77650 1    GOTO
0070  REF  2  LAST 1299             11,2407  24000 1          KEPLERN
```

```
0071                                11,2410  66350 1  FBR3     LXA,1  SSP
0072  REF  18  LAST 1282           11,2411  01500 C           DIFEQCNT
0073  REF  46  LAST 1298           11,2412  00051 C           S1
0074                                11,2413  77762 1           DEC    -13
0075                                11,2414  54345 1           DLOAD  SR
0076  REF   9  LAST 1289           11,2415  02314 C           DT/2
0077                                11,2416  20612 C           9D
0078                                11,2417  61500 C           TIX,1  ROUND
0079                                11,2420  22421 C           +1
0080                                11,2421  43206 1           PUSH   DAD
0081  REF  10  LAST 1298           11,2422  01551 1           TC
0082  REF   9  LAST 1298           11,2423  16312 C           STODL  TAU.
0083                                11,2424  77615 C           DAD
0084  REF  22  LAST 1295           11,2425  01517 C           TET
0085  REF  23  LAST 1300           11,2426  35517 1           STCALL TET
0086  REF   2  LAST 1287           11,2427  22310 C           KEPPREP
```

P0087 AGC ROUTINE TO COMPUTE ACCELERATION COMPONENTS.

```
0088                                11,2430  73150 1  ACCCMP  LXA,1   LXA,2
0089  REF  11  LAST 1298           11,2431  02150 1           PBODY    PBODY
0090  REF  12  LAST 1301           11,2432  02150 1           PBODY    PBODY
0091                                11,2433  77775 1           VLOAD
0092  REF  10  LAST 1285           11,2434  11453 0                    ZEROVEC
0093  REF   2  LAST   86           11,2435  26202 0           STOVL    FV
0094  REF  32  LAST 1206           11,2436  02152 0                    ALPHAV
0095                                11,2437  53257 1           VSL*     VAD
0096                                11,2440  57605 0                    0 -7,2
0097  REF  21  LAST 1298           11,2441  01535 0                    RCV
0098  REF   2  LAST   86           11,2442  02160 1           STORE    BETAV
0099                                11,2443  65014 1           BOF      XCHX,2
0100  REF  17  LAST 1295           11,2444  01756 1                    DIMOFLAG
0101                                11,2445  22452 1                    +5
0102  REF  19  LAST 1300           11,2446  01500 0                    DIFEQCNT
0103  REF   7  LAST   86           11,2447  12217 0           STORE    VECTAB,2
0104                                11,2450  77724 0           XCHX,2
0105  REF  20  LAST 1301           11,2451  01500 0                    DIFEQCNT
0106                                11,2452  53575 0           VLOAD    UNIT
0107  REF  33  LAST 1301           11,2453  02152 0                    ALPHAV
0108  REF  34  LAST 1301           11,2454  16152 0           STODL    ALPHAV
0109                                11,2455  00045 0                    36D
0110  REF   4  LAST 1204           11,2456  02310 1           STORE    ALPHAM
0111                                11,2457  77624 1           CALL
0112  REF   1                       11,2460  22562 0                    GAMCOMP
0113                                11,2461  66175 1           VLOAD    SXA,1
0114  REF   3  LAST 1301           11,2462  02160 1                    BETAV
0115  REF  33  LAST 1282           11,2463  00051 0                    S2
0116  REF  35  LAST 1301           11,2464  16152 0           STODL    ALPHAV
0117  REF   2  LAST   86           11,2465  02210 0                    BETAM
0118  REF   5  LAST 1301           11,2466  02310 1           STORE    ALPHAM
0119                                11,2467  71214 0           BOF      DLOAD
0120  REF   3  LAST 1288           11,2470  00342 1                    MIDFLAG
0121  REF   1                       11,2471  22725 1                    OBLATE
0122  REF  24  LAST 1300           11,2472  01517 0                    TET
0123                                11,2473  77624 1           CALL
0124  REF   2  LAST  701           11,2474  54110 0                    LSPOS
0125                                11,2475  72174 0           AXT,2    LXA,1
0126                                11,2476  00002 0                    2
0127  REF  34  LAST 1301           11,2477  00051 0                    S2
0128                                11,2500  77614 1           BOF
0129  REF  22  LAST 1295           11,2501  00343 0                    MOONFLAG
0130                                11,2502  22505 1                    +3
0131                                11,2503  77076 0           VCOMP    AXT,2
0132                                11,2504  00000 1                    0
0133  REF   4  LAST 1301           11,2505  02160 1           STORE    BETAV
0134  REF   3  LAST   86           11,2506  26263 1           STOVL    RPQV
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0135                                11,2507  00003 1                 2D
0136  REF   2 LAST   86            11,2510  02300 0          STORE  RPSV
0137                                11,2511  45335 0          SLOAD  DSU
0138  REF  14 LAST 1289            11,2512  01012 0                 MODREG
0139  REF   1                       11,2513  23721 1                 OCT27
0140                                11,2514  43030 0          BHIZ   BOF
0141                                11,2515  22520 0                 +3
0142  REF  18 LAST 1301            11,2516  01756 1                 DIMOFLAG
0143  REF   1                       11,2517  22534 0                 GETRPSV
0144                                11,2520  74375 0          VLOAD  VXSC
0145  REF  36 LAST 1301            11,2521  02152 0                 ALPHAV
0146  REF   6 LAST 1301            11,2522  02310 1                 ALPHAM
0147                                11,2523  52257 0          VSR*   VSU
0148                                11,2524  57175 0                 1,2
0149  REF   5 LAST 1301            11,2525  02160 1                 BETAV
0150                                11,2526  77724 0          XCHX,2
0151  REF  21 LAST 1301            11,2527  01500 0                 DIFEGCNT
0152  REF   8 LAST 1301            11,2530  12225 1          STORE  VECTAB +6,2
0154  REF   6 LAST  612            11,2531  02272 1          STORE  RQVV
0155                                11,2532  77724 0          XCHX,2
0156  REF  22 LAST 1302            11,2533  01500 0                 DIFEGCNT
0157                                11,2534  62175 0  GETRPSV VLOAD  INCR,1
0158  REF   4 LAST 1301            11,2535  02263 1                 RPQV
0159                                11,2536  00004 0                 4
0160                                11,2537  43014 0          CLEAR  BOF
0161  REF   3 LAST 1286            11,2540  04260 1                 RPQFLAG
0162  REF  23 LAST 1301            11,2541  00343 0                 MOONFLAG
0163                                11,2542  22547 1                 +5
0164                                11,2543  53261 1          VSR    VAD
0165                                11,2544  20612 0                 9D
0166  REF   3 LAST 1302            11,2545  02300 0                 RPSV
0167  REF   4 LAST 1302            11,2546  02300 0          STORE  RPSV
0168                                11,2547  77624 1          CALL
0169  REF   2 LAST 1301            11,2550  22562 0                 GAMCOMP
0170                                11,2551  62174 1          AXT,2  INCR,1
0171                                11,2552  00004 0                 4
0172                                11,2553  00004 0                 4
0173                                11,2554  77775 1          VLOAD
0174  REF   5 LAST 1302            11,2555  02300 0                 RPSV
0175  REF   6 LAST 1302            11,2556  36160 0          STCALL BETAV
0176  REF   3 LAST 1302            11,2557  22562 0                 GAMCOMP
0177                                11,2560  77650 1          GOTO
0178  REF   2 LAST 1301            11,2561  22725 1                 OBLATE
0179                                11,2562  74575 0  GAMCOMP VLOAD  VSR1
0180  REF   7 LAST 1302            11,2563  02160 1                 BETAV
0181                                11,2564  40236 1          VSQ    SETPD
0182                                11,2565  00001 0                 0
0183                                11,2566  61501 1          NORM   ROUND
0184                                11,2567  00040 0                 31D
0185                                11,2570  60325 0          PDDL   NORM            NORMED B SQUARED TO PD LIST
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0186  REF  7  LAST 1302   11,2571  02310 1          ALPHAM    NORMALIZE (LESS ONE) LENGTH OF ALPHA
0187                      11,2572  00041 1          32D       SAVING NORM SCALE FACTOR IN X1
0188                      11,2573  63342 1    SR1   PDVL
0189  REF  8  LAST 1302   11,2574  02160 1          BETAV     C(PDL+2) = ALMOST NORMED ALPHA
0190                      11,2575  77656 1    UNIT
0191  REF  9  LAST 1303   11,2576  16160 1    STODL BETAV
0192                      11,2577  00045 0          36D
0193  REF  3  LAST 1301   11,2600  02210 0    STORE BETAM
0194                      11,2601  55301 0    NORM  BDDV      FORM NORMALIZED QUOTIENT ALPHAM/BETAM
0195                      11,2602  00042 1          33D
0196                      11,2603  41562 0    SR1R  PUSH      C(PDL+2) = ALMOST NORMALIZED RHO.
0197                      11,2604  77743 1    DLOAD*
0198  REF  1              11,2605  27725 1          ASCALE,1
0199  REF  47 LAST 1300   11,2606  00051 0    STORE S1
0200                      11,2607  57124 1    XCHX,2 XAD,2
0201  REF  48 LAST 1303   11,2610  00050 1          S1
0202                      11,2611  00040 0          32D
0203                      11,2612  71264 1    XSU,2 DLOAD
0204                      11,2613  00041 1          33D
0205                      11,2614  00003 1          2D
0206                      11,2615  65057 0    SR*   XCHX,2
0207                      11,2616  57177 1          0 -1,2
0208  REF  49 LAST 1303   11,2617  00050 1          S1
0209                      11,2620  74406 0    PUSH  SR1R      RHO/4 TO 4D
0210                      11,2621  50315 0    PDVL  DOT
0211  REF  37 LAST 1302   11,2622  02152 0          ALPHAV
0212  REF  10 LAST 1303   11,2623  02160 1          BETAV
0213                      11,2624  44372 1    SL1R  BDSU      (RHO/4) - 2(ALPHAV/2.BETAV/2)
0214                      11,2625  57206 1    PUSH  DMPR      TO PDL+6
0215                      11,2626  00005 1          4
02155                     11,2627  77752 1    SL1
0216                      11,2630  43206 1    PUSH  DAD
0217  REF  1              11,2631  23701 0          DQUARTER
0218                      11,2632  75406 1    PUSH  SQRT
0219                      11,2633  41475 1    DMPR  PUSH
0220                      11,2634  00013 0          10D
0221                      11,2635  43352 1    SL1   DAD
0222  REF  2  LAST 1303   11,2636  23701 0          DQUARTER
0223                      11,2637  43325 1    PDDL  DAD       (1/4)+2((Q+1)/4)    TO PD+14D
0224                      11,2640  00013 0          10D
0225  REF  1              11,2641  11451 1          HALFDP
0226                      11,2642  72475 1    DMPR  SL1
0227                      11,2643  00011 1          8D
0228                      11,2644  56215 1    DAD   DDV
0229  REF  1              11,2645  23673 1          THREE/8
0230                      11,2646  00017 1          14D
0231                      11,2647  74275 1    DMPR  VXSC
0232                      11,2650  00007 0          6
0233  REF  11 LAST 1303   11,2651  02160 1          BETAV     -
0234                      11,2652  64515 1    PDVL  VSR3      (G/2)(C(PD+4))B/2 TO PD+16D
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0235   REF  38  LAST 1303   11,2653   02152 0                ALPHAV
0236                        11,2654   41455 0          VAD   PUSH      A12 + C(PD+16D) TO PD+16D
0237                        11,2655   41345 0          DLOAD DMP
0238                        11,2656   00001 0                0
0239                        11,2657   00015 0                12D       -
0240                        11,2660   61501 1          NORM  ROUND
0241                        11,2661   00037 0                30D
0242                        11,2662   40665 0          BDDV  DMP*
0243                        11,2663   00003 1                2
0244   REF   6  LAST 1298   11,2664   50044 1                MUEARTH,2
0245                        11,2665   74276 1          DCOMP VXSC
0246                        11,2666   57124 1          XCHX,2 XAD,2
0247   REF  50  LAST 1303   11,2667   00050 1                S1
0248   REF  35  LAST 1301   11,2670   00051 0                S2
0249                        11,2671   55064 0          XSU,2 XSU,2
0250                        11,2672   00036 1                30D
0251                        11,2673   00037 0                31D
02513                       11,2674   77600 1          BOV                CLEAR OVIND
02516                       11,2675   22676 0                +1
0252                        11,2676   65057 0          VSR*  XCHX,2
0253                        11,2677   57177 1                0 -1,2
0254   REF  51  LAST 1304   11,2700   00050 1                S1
0255                        11,2701   77655 1          VAD
0256   REF   3  LAST 1301   11,2702   02202 0                FV
0257   REF   4  LAST 1304   11,2703   02202 0          STORE FV
02585                       11,2704   43400 1          BOV   RVQ          RETURN IF NO OVERFLOW
02581                       11,2705   22706 0                +1
02582  REF   2  LAST   86   11,2707   02212 1                H
02583                       11,2710   20612 0                9D
02584  REF  10  LAST 1300   11,2711   44206 0          PUSH  BDSU
02585  REF  11  LAST 1300   11,2712   01551 1                TC
02586  REF  10  LAST 1300   11,2713   16312 0          STODL TAU.
02587  REF  25  LAST 1301   11,2714   01517 0                TET
02588                       11,2715   45425 0          DSU   STADR
02589  REF  26  LAST 1304   11,2716   42260 0          STCALL TET
02586  REF   3  LAST 1300   11,2717   22310 0                KEPPREP
02585                       11,2720   77624 1          CALL
02587  REF   6  LAST 1296   11,2721   23344 0                RECTIFY
02587                       11,2722   77614 1          SETGO
02588  REF   4  LAST 1302   11,2723   04020 1                RPQFLAG
02588  REF   4  LAST 1295   11,2724   27234 1                TESTLOOP
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P0259  THE OBLATE ROUTINE COMPUTES THE ACCELERATION DUE TO OBLATENESS. IT USES THE UNIT OF THE VEHICLE
R0261  POSITION VECTOR FOUND IN ALPHAV AND THE DISTANCE TO THE CENTER IN ALPHAM. THIS IS ADDED TO THE SUM OF THE
R0263  DISTURBING ACCELERATIONS IN EV AND THE PROPER DIFEQ STAGE IS CALLED VIA X1.
 0265                              11,2725  71354 C  OBLATE  LXA,2   DLOAD
 0266  REF  13  LAST 1301         11,2726  02150 1            PBODY
 0267  REF   8  LAST 1303         11,2727  02310 1            ALPHAM
 0268                              11,2730  44601 C          SETPD   DSU*
 0269                              11,2731  00001 C                  0
 0270  REF   1                     11,2732  50012 1                  RDE,2
 0271                              11,2733  43044 C          BPL     BOF             GET URPV
 0272  REF   1                     11,2734  23135 1                  NBRANCH
 0273  REF  24  LAST 1302         11,2735  00343 C                  MOONFLAG
 0274  REF   1                     11,2736  23144 1                  COSPHIE
 0275                              11,2737  65375 0          VLOAD   PDDL
 0276  REF  39  LAST 1304         11,2740  02152 C                  ALPHAV
 0277  REF  27  LAST 1304         11,2741  01517 C                  TET
 0278                              11,2742  45125 C          PDDL    CALL
 0279  REF   1                     11,2743  23671 C                  3/5
 0280  REF   4  LAST 1203         11,2744  55366 1                  R-TO-RP
 0284  REF   1                     11,2745  00017 1          STORE   URPV
 0285                              11,2746  47375 C          VLOAD   VXV
 0286  REF   3  LAST 1212         11,2747  02012 C                  504LM
 0287  REF   3  LAST 1283         11,2750  11445 1                  ZUNIT
 0288                              11,2751  61255 1          VAD     VXM
 0289  REF   4  LAST 1305         11,2752  11445 1                  ZUNIT
 0290  REF   8  LAST 1215         11,2753  00025 C                  MMATRIX
 0291                              11,2754  77656 1          UNIT                    POSSIBLY UNNECESSARY
 0292  REF   1                     11,2755  00025 C  CONTERM STORE   UZ
 0293                              11,2756  57345 1          DLOAD   DMPR
 0294  REF   1                     11,2757  00023 C                  COSPHI/2
 0295  REF   1                     11,2760  23703 1                  3/32
 0296                              11,2761  63525 C          PDDL    DSQ             P2/64 TO PDD
 0297  REF   2  LAST 1305         11,2762  00023 C                  COSPHI/2
 0298                              11,2763  45275 C          DMPR    DSU
 0299  REF   1                     11,2764  23705 1                  15/16
 0300  REF   1                     11,2765  23677 0                  3/64
 0301                              11,2766  57206 1          PUSH    DMPR            P3/32 TO PD2
 0302  REF   3  LAST 1305         11,2767  00023 C                  COSPHI/2
 0303                              11,2770  76405 1          DMP     SL1R
 0304  REF   1                     11,2771  23711 1                  7/12
 0305                              11,2772  57325 1          PDDL    DMPR
 0306                              11,2773  00001 0                  0
 0307  REF   1                     11,2774  23717 1                  2/3
 0308                              11,2775  41421 C          BDSU    PUSH            P4/128 TO PD4
 0309                              11,2776  57275 C          DMPR    DMPR
 0310  REF   4  LAST 1305         11,2777  00023 C                  COSPHI/2        BEGIN COMPUTING P5/1024
 0311  REF   1                     11,3000  23713 C                  9/16
 0312                              11,3001  57325 1          PDDL    DMPR
 0313                              11,3002  00003 1                  2
 0314  REF   1                     11,3003  23715 C                  5/128
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0315                                  11,3004  77621 1        BDSU
0316                                  11,3005  77603 1        DMP*
0317  REF   1                        11,3006  50040 0                J4REQ/J3,2
0318                                  11,3007  43271 1        DDV     DAD                    -3
0319  REF   9  LAST 1305             11,3010  02310 1                ALPHAM          (((P5/256)B 2 /R+P4/32)  /R+P3/8)ALPHAV
0320                                  11,3011  00005 1                4                    4              3
0321                                  11,3012  56273 1        DMPR*   DDV
0322  REF   1                        11,3013  50034 0                2J3RE/J2,2
0323  REF  10  LAST 1306             11,3014  02310 1                ALPHAM
0324                                  11,3015  74215 1        DAD     VXSC
0325                                  11,3016  00003 1                2
0326  REF  40  LAST 1305             11,3017  02152 0                ALPHAV
0327  REF   1                        11,3020  14033 1        STODL   TVEC
0328                                  11,3021  70403 1        DMP*    SR1
0329  REF   2  LAST 1306             11,3022  50040 0                J4REQ/J3,2
0330                                  11,3023  43271 1        DDV     DAD
0331  REF  11  LAST 1306             11,3024  02310 1                ALPHAM                 -3
0332                                  11,3025  50473 1        DMPR*   SR3
0333  REF   2  LAST 1306             11,3026  50034 0                2J3RE/J2,2       3          4
0334                                  11,3027  43271 1        DDV     DAD
0335  REF  12  LAST 1306             11,3030  02310 1                ALPHAM
0336                                  11,3031  76561 1        VXSC    VSL1
0337  REF   2  LAST 1305             11,3032  00025 0                UZ
0338                                  11,3033  77645 0        BVSU
0339  REF   2  LAST 1306             11,3034  00033 1                TVEC
0340  REF   3  LAST 1306             11,3035  14033 1        STODL   TVEC
0341  REF  13  LAST 1306             11,3036  02310 1                ALPHAM
0342                                  11,3037  63501 0        NORM    DSQ
0343  REF  85  LAST 1298             11,3040  00047 1                X1
0344                                  11,3041  60316 0        DSQ     NORM
0345  REF  52  LAST 1304             11,3042  00051 0                S1                     4
0346                                  11,3043  54606 0        PUSH    BDDV*          NORMED R  TO OD
0347  REF   1                        11,3044  50030 1                J2REGSQ,2
0348                                  11,3045  77761 1        VXSC
0349  REF   4  LAST 1306             11,3046  00033 1                TVEC
0350  REF   5  LAST 1306             11,3047  00033 1        STORE   TVEC
0351                                  11,3050  56070 0        XAD,1   XAD,1
0352  REF  86  LAST 1306             11,3051  00046 0                X1
0353  REF  87  LAST 1306             11,3052  00046 0                X1
0354                                  11,3053  43070 1        XAD,1   BOF
0355  REF  53  LAST 1306             11,3054  00050 1                S1
0356  REF  25  LAST 1305             11,3055  00343 0                MOONFLAG
0357  REF   1                        11,3056  23125 0                NBRANCH1
0358                                  11,3057  63545 0        DLOAD   DSQ                    2
0359  REF   2  LAST 1305             11,3060  00017 1                URPV           X  B-2 TO 2D
0360                                  11,3061  63525 0        PDDL    DSQ
0361  REF   3  LAST 1306             11,3062  00021 1                URPV +2          2  2
0362                                  11,3063  65215 1        DAD     PDDL           Y +X  B-2 TO 2D
0363                                  11,3064  00003 1                2D
0364                                  11,3065  45352 1        SL1     DSU
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0365                          11,3066  00003 1                 2D
0366                          11,3067  41525 C          PDDL   PUSH      X -Y  B-2 TO 4D  COSPHI 2 TO 6D
0367  REF   5  LAST 1305     11,3070  00023 C                 COSPHI/2
0368                          11,3071  65361 C          VXSC   PDDL      2COSPHI(UZ) B-3 TO 6D
0369  REF   3  LAST 1306     11,3072  00025 C                 UZ
0370                          11,3073  45316 1          DSQ    DSU
0371  REF   2  LAST 1305     11,3074  23671 C                 3/5          2  2        2
0372                          11,3075  52405 1          DMP    SL3       (X -Y)((5COS (PHI)-3)UR 2COS(PHI)UZ)
0373  REF   3  LAST 1283     11,3076  27753 C                 5/8
0374                          11,3077  52361 1          VXSC   VSU             B-3 TO 4D
0375  REF  41  LAST 1306     11,3100  02152 C                 ALPHAV
0376                          11,3101  72561 C          VXSC   VSL2
0377                          11,3102  77725 1          PDDL
0378  REF   4  LAST 1306     11,3103  00017 1                 URPV
0379                          11,3104  63205 C          DMP    PDVL      XY B-2 TO 10D
0380  REF   5  LAST 1307     11,3105  00021 1                 URPV +2
0381  REF  42  LAST 1307     11,3106  02152 C                 ALPHAV
0382                          11,3107  74235 C          VXV    VXSC
0383  REF   4  LAST 1307     11,3110  00025 C                 UZ
0384                          11,3111  53332 C          VSL3   VAD       4XY(UR X UZ) + D( 4D) B-3
0385                          11,3112  77725 1          PDDL
0386                          11,3113  41301 C          NORM   DMP
03861 REF  36  LAST 1252      11,3114  00050 1                 X2
0387                          11,3115  00001 C                 DD        3J22R2MU/(X +Y )R
03871                         11,3116  74265 C                 BDDV      VXSC
0388  REF   1                 11,3117  27751 1                 3J22R2MU
0389                          11,3120  53257 1          VSL*   VAD
0390                          11,3121  57605 C                 0 -7,2
0391  REF   6  LAST 1306     11,3122  00033 1                 TVEC
03911                         11,3123  77754 1          LXA,2
03912 REF  14  LAST 1305      11,3124  02150 1                 PBODY
03913                         11,3125  77600 1  NBRANCH1 BOV
03916                         11,3126  23127 1                 +1
0392                          11,3127  53257 1          VSL*   VAD
0393                          11,3130  20153 1                 0 -22D,1
0394  REF   5  LAST 1304     11,3131  02202 C                 FV
0395  REF   6  LAST 1307     11,3132  02202 C          STORE  FV
03953                         11,3133  77600 1          BOV
03956 REF   1                 11,3134  22706 C                 GOBACUE
0396                          11,3135  72135 C  NBRANCH SLOAD  LXA,1
0397  REF  23  LAST 1302      11,3136  01501 1                 DIFECCNT
0398  REF 658  LAST 1295      11,3137  00154 1                 MPAC
0399                          11,3140  73205 1          DMP    CGOTC
0400  REF   1                 11,3141  27755 C                 -1/12
0401  REF 659  LAST 1307      11,3142  00155 C                 MPAC
0402  REF   1                 11,3143  23152 C                 DIFECTAB
0403                          11,3144  77745 1  COSPHIE DLOAD
0404  REF  43  LAST 1307      11,3145  02156 1                 ALPHAV +4
0405  REF   6  LAST 1307      11,3146  24023 C          STOVL  COSPHI/2
0406  REF   5  LAST 1305      11,3147  11445 1                 ZUNIT
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0407                                11,3150  77650 1            GOTO
0408  REF   1                      11,3151  22755 0                 COMTERM
0409  REF   1                      11,3152  23371 0  DIFEQTAB CADR  DIFEQ+0
0410  REF   1                      11,3153  23375 1           CADR  DIFEQ+1
0411  REF   1                      11,3154  23406 1           CADR  DIFEQ+2
0412                               11,3155  77214 0  TIMESTEP BOF   VLOAD
0413  REF   4  LAST 1301          11,3156  00342 1                 MIDFLAG
0414  REF   1                      11,3157  23206 1                 RECTEST
0415  REF  22  LAST 1301          11,3160  01535 0                 RCV
0416                               11,3161  41241 0           DOT   DMP
04162 REF  17  LAST 1298          11,3162  01543 1                 VCV
04163 REF  10  LAST 130C          11,3163  02314 0                 DT/2          (R,V) X (DELTA T)
04164                              11,3164  77640 0           BMN
04166 REF   2  LAST 1308          11,3165  23206 1                 RECTEST
0417                               11,3166  43014 0           BON   BOF
0418  REF  26  LAST 1306          11,3167  00303 1                 MOONFLAG
0419  REF   1                      11,3170  23263 1                 LUNSPH
0420  REF   5  LAST 1304          11,3171  04340 1                 RPQFLAG
0421  REF   1                      11,3172  23260 1                 EARSPH
0422                               11,3173  45145 0           DLOAD CALL
0423  REF  28  LAST 1309          11,3174  01517 0                 TET
0424  REF   3  LAST 1301          11,3175  54110 0                 LSPOS         RPQV IN MPAC
0425  REF   5  LAST 1302          11,3176  02263 1           STORE RPQV          RPQV
04253                              11,3177  77754 1           LXA,2
04256 REF  15  LAST 1307          11,3200  02150 1                 PBODY
0426                               11,3201  51445 0  INLUNCHK BVSU  ABVAL
0427  REF  23  LAST 1308          11,3202  01535 0                 RCV
0428                               11,3203  50025 0           DSU   BMN
0429  REF   1                      11,3204  27761 1                 RSPHERE
0430  REF   1                      11,3205  23300 0                 DOSWITCH
0434                               11,3206  51575 1  RECTEST  VLOAD ABVAL         RECTIFY IF
04345 REF   8  LAST 1285          11,3207  01521 0                 TDELTAV
04346                              11,3210  77600 1           BOV
04347 REF   1                      11,3211  23234 0                 CALLRECT
0435                               11,3212  51025 1           DSU   BPL             1) EITHER TDELTAV OR TNUV EQUALS OR
04355 REF   2  LAST   32          11,3213  23707 0                 3/4                  EXCEEDS 3/4 IN MAGNITUDE
0436  REF   2  LAST 1308          11,3214  23234 0                 CALLRECT
04365                              11,3215  53615 0           DAD   SL*                          OR
0437  REF   3  LAST 1308          11,3216  23707 0                 3/4
04375                              11,3217  57605 0                 0 -7,2        2) ABVAL(TDELTAV) EQUALS OR EXCEEDS
0438                               11,3220  45271 1           DDV   DSU               .01(ABVAL(RCV))
04385                              11,3221  00013 0                 1DD
0439  REF   1                      11,3222  27757 1                 RECRATIO
04395                              11,3223  77244 0           BPL   VLOAD
0440  REF   3  LAST 1308          11,3224  23234 0                 CALLRECT
0441  REF   8  LAST 1285          11,3225  01527 0                 TNUV
0442                               11,3226  45246 0           ABVAL DSU
0443  REF   4  LAST 1308          11,3227  23707 0                 3/4
04431                              11,3230  77600 1           BOV
04432 REF   4  LAST 1308          11,3231  23234 0                 CALLRECT
```

```
0444                                11,3232  77640 0            BMN
0445   REF   1                     11,3233  23236 1                       INTGRATE
04453                               11,3234  77624 1  CALLRECT CALL
04456  REF   7  LAST 1304          11,3235  23344 0                       RECTIFY
0446                                11,3236  77775 1  INTGRATE VLOAD
0447   REF   9  LAST 1308          11,3237  01527 0                       TNUV
0448   REF   1                     11,3240  25120 0            STOVL      ZV
0449   REF   9  LAST 1308          11,3241  01521 0                       TDELTAV
0450   REF   2  LAST   75          11,3242  01112 1            STORE      VV
0451                                11,3243  77614 1            CLEAR
0452   REF   1                     11,3244  00261 1                       JSWITCH
0453                                11,3245  66375 0  DIFEQQ    VLOAD      SSP
0454   REF   3  LAST 1309          11,3246  01112 1                       VV
0455   REF  24  LAST 1307          11,3247  01501 1                       DIFEQCNT
0456                                11,3250  00000 1                       0
0457   REF  44  LAST 1307          11,3251  16152 0            STODL      ALPHAV
0458   REF   3  LAST 1207          11,3252  11453 0                       DPZERO
0459   REF   3  LAST 1304          11,3253  02212 1            STORE      H          START H AT ZERO. GOES 0(DELT/2)DELT.
0460                                11,3254  52014 0            BON        GOTO
0461   REF   2  LAST 1309          11,3255  00301 0                       JSWITCH
0462   REF   1                     11,3256  23610 1                       DOW..
0463   REF   1                     11,3257  22430 0                       ACCOMP
0464                                11,3260  52175 0  EARSPH    VLOAD      GOTO
04641  REF   6  LAST 1308          11,3261  02263 1                       RPQV
04642  REF   1                     11,3262  23201 0                       INLUNCHK
04643                               11,3263  60545 0  LUNSPH    DLOAD      SR2
04644                               11,3264  00013 0                       10D
04645                               11,3265  50025 0            DSU        BMN
04646  REF   2  LAST 1308          11,3266  27761 1                       RSPHERE
04647  REF   3  LAST 1308          11,3267  23206 1                       RECTEST
04648                               11,3270  71214 0            BOF        DLOAD
04649  REF   6  LAST 1308          11,3271  04340 1                       RPQFLAG
0465   REF   2  LAST 1308          11,3272  23300 0                       DOSWITCH
04651  REF  29  LAST 1308          11,3273  01517 0                       TET
04652                               11,3274  77624 1            CALL
0466   REF   2  LAST  884          11,3275  54115 0                       LUNPCS
0467                                11,3276  77676 0            VCOMP
0468   REF   7  LAST 1309          11,3277  02263 1            STORE      RPQV
0469                                11,3300  77624 1  OOSWITCH CALL
0470   REF   1                     11,3301  23304 1                       ORIGCHNG
0471                                11,3302  77650 1            GOTO
0472   REF   2  LAST 1309          11,3303  23236 1                       INTGRATE
0473                                11,3304  45020 1  ORIGCHNG  STQ        CALL
0474   REF   3  LAST   86          11,3305  02270 0                       ORIGEX
0475   REF   8  LAST 1309          11,3306  23344 0                       RECTIFY
0476                                11,3307  53775 1            VLOAD      VSL*
0477   REF  24  LAST 1308          11,3310  01535 0                       RCV
0478                                11,3311  57576 1                       0,2
0479                                11,3312  53651 0            VSU        VSL*
0480   REF   8  LAST 1309          11,3313  02263 1                       RPQV
```

```
0481                                  11,3314  57574 C                2,2
0482  REF  13  LAST 1296             11,3315  01503 C          STORE RRECT
0483  REF  25  LAST 1305             11,3316  15535 C          STODL RCV
0484  REF  30  LAST 1305             11,3317  01517 C                TET
0485                                  11,3320  77624 1          CALL
0486  REF   1                        11,3321  54120 C                LUNVEL
0487                                  11,3322  57414 1          BOF   VCOMP
0488  REF  27  LAST 1308             11,3323  00343 C                MOONFLAG
0489                                  11,3324  23325 1                +1
0490                                  11,3325  53715 1          PDVL  VSL*
0491  REF  18  LAST 1308             11,3326  01543 1                VCV
0492                                  11,3327  57576 1                0,2
0493                                  11,3330  77651 0          VSU
0494                                  11,3331  77657 0          VSL*
0495                                  11,3332  57574 C                0 +2,2
0496  REF   9  LAST 1296             11,3333  01511 C          STORE VRECT
0497  REF  19  LAST 1310             11,3334  01543 1          STORE VCV
0498                                  11,3335  67154 C          LXA,2 SXA,2
0499  REF   4  LAST 1305             11,3336  02270 C                ORIGEX
0500  REF  26  LAST 1290             11,3337  00052 C                QPRET
0501                                  11,3340  52014 C          BON   GOTO
0502  REF  28  LAST 1310             11,3341  00303 1                MOONFLAG
0503  REF   2  LAST 1282             11,3342  26666 C                CLRMCON
0504  REF   3  LAST 1282             11,3343  26673 1                SETMCON
```

P0505 THE RECTIFY SUBROUTINE IS CALLED BY THE INTEGRATION PROGRAM AND OCCASIONALLY BY THE MEASUREMENT INCORPORATION
R0507 ROUTINES TO ESTABLISH A NEW CONIC.

```
0508                              11,3344   77354 C  RECTIFY  LXA,2   VLOAD
0509  REF  16  LAST 1308         11,3345   02150 1            PBODY
0510  REF  10  LAST 1309         11,3346   01521 C            TDELTAV
0511                              11,3347   53257 1      VSL*  VAD
0512                              11,3350   57605 C            0 -7,2
0513  REF  26  LAST 1310         11,3351   01535 C            RCV
0514  REF  14  LAST 1310         11,3352   01503 C       STORE  RRECT
0515  REF  27  LAST 1311         11,3353   25535 C       STOVL  RCV
0516  REF  10  LAST 1309         11,3354   01527 C            TNUV
0517                              11,3355   53257 1      VSL*  VAD
0518                              11,3356   57602 1            0 -4,2
0519  REF  20  LAST 1310         11,3357   01543 1            VCV
0520  REF  10  LAST 1310         11,3360   01511 C  MINIRECT STORE  VRECT
0521  REF  21  LAST 1311         11,3361   25543 1       STOVL  VCV
0522  REF  11  LAST 1301         11,3362   11453 C            ZEROVEC
0523  REF  11  LAST 1311         11,3363   01521 C       STORE  TDELTAV
0524  REF  11  LAST 1311         11,3364   15527 C       STODL  TNUV
0525  REF  12  LAST 1311         11,3365   11453 C            ZEROVEC
0526  REF  12  LAST 1304         11,3366   01551 1       STORE  TC
0527  REF   3  LAST 1299         11,3367   01553 C       STORE  XKEP
0528                              11,3370   77616 C       RVQ
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P0529   THE THREE DIFEQ ROUTINES - DIFEQ+0, DIFEQ+12, AND DIFEQ+24 - ARE ENTEREDTO PROCESS THE CONTRIBUTIONS AT THE
R0531   BEGINNING, MIDDLE, AND END OF THE TIMESTEP, RESPECTIVELY. THE UPDATING IS DONE BY THE NYSTROM METHOD.
0533                            11,3371  64575 1  DIFEQ+0  VLOAD   VSR3
0534    REF   7  LAST 1307      11,3372  02202 C           FV
0535    REF   2  LAST   86      11,3373  36166 C           STCALL  PHIV
0536    REF   1                 11,3374  23551 1           DIFEQCOM
0537                            11,3375  74575 C  DIFEQ+1  VLOAD   VSR1
0538    REF   8  LAST 1312      11,3376  02202 C           FV
0539                            11,3377  53206 C           PUSH    VAD
0540    REF   3  LAST 1312      11,3400  02166 1           PHIV
0541    REF   2  LAST   86      11,3401  26174 1           STOVL   PSIV
0542                            11,3402  53362 C           VSR1    VAD
0543    REF   4  LAST 1312      11,3403  02166 1           PHIV
0544    REF   5  LAST 1312      11,3404  36166 C           STCALL  PHIV
0545    REF   2  LAST 1312      11,3405  23551 1           DIFEQCOM
0546                            11,3406  57345 1  DIFEQ+2  DLOAD   DMPR
0547    REF   4  LAST 1309      11,3407  02212 1           H
0548    REF   2  LAST 1298      11,3410  23717 1           DP2/3
0549                            11,3411  74206 C           PUSH    VXSC
0550    REF   6  LAST 1312      11,3412  02166 1           PHIV
0551                            11,3413  53372 1           VSL1    VAD
0552    REF   2  LAST 1309      11,3414  01120 C           ZV
0553                            11,3415  53361 C           VXSC    VAD
0554    REF   5  LAST 1312      11,3416  02212 1           H
0555    REF   4  LAST 1309      11,3417  01112 1           YV
0556    REF   5  LAST 1312      11,3420  25112 1           STOVL   YV
0557    REF   9  LAST 1312      11,3421  02202 C           FV
0558                            11,3422  53322 1           VSR3    VAD
0559    REF   3  LAST 1312      11,3423  02174 1           PSIV
0560                            11,3424  76561 1           VXSC    VSL1
0561                            11,3425  77655 1           VAD
0562    REF   3  LAST 1312      11,3426  01120 C           ZV
0564    REF   4  LAST 1312      11,3427  01120 C           STORE   ZV
0565                            11,3430  45014 C           BOFF    CALL
0566    REF   3  LAST 1309      11,3431  00341 1           JSWITCH
0567    REF   1                 11,3432  23502 1           ENDSTATE
0568    REF  23  LAST 1286      11,3433  56712 C           GRP2PC
0569                            11,3434  77354 C           LXA,2   VLOAD
0570    REF   2  LAST   75      11,3435  01102 C           COLREG
0571    REF   5  LAST 1312      11,3436  01120 C           ZV
0572                            11,3437  77732 1           VSL3                    ADJUST W-POSITION FOR STORAGE
0573    REF  70  LAST 1225      11,3440  12467 1           STORE   W +54D,2
0574                            11,3441  77775 1           VLOAD
0575    REF   6  LAST 1312      11,3442  01112 1           YV
0576                            11,3443  40132 C           VSL3    BOV
0577    REF   1                 11,3444  23574 C           WMATEND
0578    REF  71  LAST 1312      11,3445  12401 1           STORE   W,2

0579                            11,3446  77624 1           CALL
0580    REF  24  LAST 1312      11,3447  56712 C           GRP2PC
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0581                                11,3450  66354 C          LXA,2  SSP
0582  REF   3  LAST 1312           11,3451  01102 C                 COLREG
0583  REF  36  LAST 1304           11,3452  00052 C                 S2
0584                                11,3453  00000 1                 0
0585                                11,3454  67114 1          INCR,2 SXA,2
0586                                11,3455  00006 1                 6
0587  REF   7  LAST 1312           11,3456  01111 1                 YV
0588                                11,3457  45104 C          TIX,2  CALL
0589  REF   1                       11,3460  23545 1                 RELOADSV
0590  REF  25  LAST 1312           11,3461  56712 C                 GRP2PC
0591                                11,3462  67154 C          LXA,2  SXA,2
0592  REF   8  LAST 1313           11,3463  01111 1                 YV
0593  REF   4  LAST 1313           11,3464  01102 C                 COLREG

0594                                11,3465  77624 1  NEXTCOL CALL
0595  REF  26  LAST 1313           11,3466  56712 C                 GRP2PC
0596                                11,3467  76754 C          LXA,2  VLOAC*
0597  REF   9  LAST 1313           11,3470  01102 C                 COLREG
0598  REF  72  LAST 1312           11,3471  75376 1                 W,2
0599                                11,3472  77722 C          VSR3                ADJUST W-POSITION FOR INTEGRATION
0600  REF   9  LAST 1313           11,3473  01112 1          STORE  YV
0601                                11,3474  76173 C          VLOAD* AXT,1
0602  REF  73  LAST 1313           11,3475  75310 1                 W +54D,2
0603                                11,3476  00000 1                 0
0604                                11,3477  77722 C          VSR3                ADJUST W-VELOCITY FOR INTEGRATION
0605  REF   6  LAST 1312           11,3500  35120 1          STCALL ZV
0606  REF   1                       11,3501  23245 C                 DIFECO

0607                                11,3502  77200 C  ENDSTATE BOV    VLOAD
06071 REF   2  LAST 1307           11,3503  22706 C                 GOBAQUE
0608  REF   7  LAST 1313           11,3504  01120 C                 ZV
0609  REF  12  LAST 1311           11,3505  25527 C          STOVL  TNUV
0610  REF  10  LAST 1313           11,3506  01112 1                 YV
0611  REF  12  LAST 1311           11,3507  01521 C          STORE  TDELTAV
0612                                11,3510  43014 C          BON    BOFF
06121 REF   3  LAST 1295           11,3511  04715 C                 MIDAVFLG
06122 REF   1                       11,3512  27650 1                 CKMID2              CHECK FOR MID2 BEFORE GOING TO TIMEINC
0613  REF  19  LAST 1302           11,3513  01756 1                 DIMOFLAG
0614  REF   5  LAST 1304           11,3514  27234 1                 TESTLOOP
06141                               11,3515  77776 1          EXIT
0615  REF 100  LAST 1297           11,3516  0 5301 C         TC     PHASCHNG
0616                                11,3517  04022 C          OCT    04022               PHASE 1
0617  REF  50  LAST 1286           11,3520  0 5435 C         TC     UPFLAG              PHASE CHANGE HAS OCCURRED BETWEEN
0618  REF   4  LAST 1286           11,3521  00236 C          ADRES  REINTFLG            INTSTALL AND INTWAKE
0620  REF 240  LAST 1297           11,3522  0 6006 1         TC     INTPRET
0621                                11,3523  77731 1          SSP
06215 REF  27  LAST 1310           11,3524  00053 1                 QPRET
0622  REF   1                       11,3525  23532 1                 AMOVED
0623                                11,3526  52014 C          BON    GOTO
0624  REF  20  LAST 1293           11,3527  01714 1                 VINTFLAG
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0625   REF   4  LAST 1297   11,3530   26636 C                    ATOPCSM
0626   REF   4  LAST 1297   11,3531   26711 1                    ATOPLEM
0627                        11,3532   66214 C  AMOVED    SET     SSP
0628   REF   4  LAST 1312   11,3533   00061 C                    JSWITCH
0629   REF   6  LAST 1313   11,3534   01103 1                    COLREG
0630                        11,3535   77741 C            DEC     -30
0631                        11,3536   66214 C            BOFF    SSP
0632   REF   8  LAST 1293   11,3537   01755 1                    D6OR9FLG
0633   REF   1              11,3540   23465 1                    NEXTCOL
0634   REF   7  LAST 1314   11,3541   01103 1                    COLREG
0635                        11,3542   77717 C            DEC     -48
0636                        11,3543   77650 1            GOTO
0637   REF   2  LAST 1314   11,3544   23465 1                    NEXTCOL


0638                        11,3545   77745 1  RELOADSV  DLOAD                RELOAD TEMPORARY STATE VECTOR
0639   REF   9  LAST 1295   11,3546   01101 0                    TDEC        FROM PERMANENT IN CASE OF
0640   REF  55  LAST 1294   11,3547   34041 C            STCALL  TDEC1
0641   REF   1              11,3550   27120 1                    INTEGRV2    BY STARTING AT INTEGRV2.
0642                        11,3551   43345 1  DIFEQCOM  DLOAD   DAD         INCREMENT H AND DIFEQCNT.
0643   REF  11  LAST 1308   11,3552   02314 0                    DT/2
0644   REF   6  LAST 1312   11,3553   02212 1                    H
0645                        11,3554   66110 1            INCR,1  SXA,1
0646                        11,3555   77763 C            DEC     -12
0647   REF  25  LAST 1309   11,3556   01500 0                    DIFEQCNT    DIFEQCNT SET FOR NEXT ENTRY.
0648   REF   7  LAST 1314   11,3557   02212 1            STORE   H
0649                        11,3560   74561 C            VXSC    VSR1
0650   REF  10  LAST 1312   11,3561   02202 C                    FV
0651                        11,3562   74255 C            VAD     VXSC
0652   REF   8  LAST 1313   11,3563   01120 0                    ZV
0653   REF   8  LAST 1314   11,3564   02212 1                    H
0654                        11,3565   77655 1            VAD
0655   REF  11  LAST 1313   11,3566   01112 1                    YV
0656   REF  45  LAST 1309   11,3567   02152 C            STORE   ALPHAV
0657                        11,3570   52014 C            BON     GOTO
0658   REF   5  LAST 1314   11,3571   00301 C                    JSWITCH
0659   REF   2  LAST 1309   11,3572   23610 1                    DOW..
0660   REF   1              11,3573   22410 1                    FBR3


0661                        11,3574   43014 C  WMATEND   CLEAR   CLEAR
0662   REF  20  LAST 1313   11,3575   01676 1                    DIMOFLAG    DONT INTEGRATE W THIS TIME
0663   REF  13  LAST 1297   11,3576   01671 0                    ORBWFLAG    INVALICATE W
06631                       11,3577   77614 1            CLEAR
06632  REF  12  LAST 1297   11,3600   02676 1                    RENDWFLG
0664                        11,3601   77414 C            SET     EXIT
0665   REF   7  LAST 1288   11,3602   01472 1                    STATEFLG    PICK UP STATE VECTOR UPDATE
0666   REF  34  LAST 1296   11,3603   0 5537 0           TC      ALARM
0667                        11,3604   00421 C            OCT     421
0668   REF 241  LAST 1313   11,3605   0 6006 1           TC      INTPRET
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0669                          11,3606   77650 1          GOTO
0670   REF   6  LAST 1313     11,3607   27234 1                    TESTLOOP       FINISH INTEGRATING STATE VECTOR
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L ORBITAL INTEGRATION

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P0671   CREITAL ROUTINE FOR EXTRAPOLATION OF THE W MATRIX. IT COMPUTES THE SECOND DERIVATIVE OF EACH COLUMN POSITION
R0673   VECTOR OF THE MATRIX AND CALLS THE NYSTROM INTEGRATION ROUTINES TO SOLVETHE DIFFERENTIAL EQUATIONS. THE PROGRAM
R0675   USES A TABLE OF VEHICLE POSITION VECTORS COMPUTED DURING THE INTEGRATION OF THE VEHICLES POSITION AND VELOCITY.
0677                                  11,3610  70754 C  DOW..   LXA,2  DLOAD*
0678  REF  17  LAST 1311             11,3611  02150 1           PBODY
0679  REF   7  LAST 1304             11,3612  50044 1           MUEARTH,2
0680  REF   4  LAST 1303             11,3613  36210 1           STCALL BETAM
0681  REF   1                        11,3614  23636 C           DOW..1
0682  REF  11  LAST 1314             11,3615  02202 C           STORE  FV
0683                                  11,3616  62014 C           BOF    INCR,1
0684  REF   5  LAST 1308             11,3617  00342 1           MIDFLAG
0685  REF   2  LAST 1305             11,3620  23135 1           NBRANCH
0686                                  11,3621  77771 0           DEC    -6
0687                                  11,3622  70744 1           LXC,2  DLOAD*
0688  REF  18  LAST 1316             11,3623  02150 1           PBODY
0689  REF   8  LAST 1316             11,3624  50046 C           MUEARTH -2,2
0690  REF   5  LAST 1316             11,3625  36210 1           STCALL BETAM
0691  REF   2  LAST 1316             11,3626  23636 C           DOW..1
0692                                  11,3627  50414 0           BON    VSR6
0693  REF  29  LAST 131C             11,3630  00303 1           MOONFLAG
0694                                  11,3631  23632 1           +1
0695                                  11,3632  77655 1           VAD
0696  REF  12  LAST 1316             11,3633  02202 C           FV
0697  REF  13  LAST 1316             11,3634  36202 1           STCALL FV
0698  REF   3  LAST 1316             11,3635  23135 1           NBRANCH
0699                                  11,3636  60575 C  DOW..1   VLOAD  VSR4
0700  REF  46  LAST 1314             11,3637  02152 C           ALPHAV
0701                                  11,3640  53513 C           PDVL*  UNIT
0702  REF   9  LAST 1302             11,3641  02217 1           VECTAB,1
0703                                  11,3642  46315 1           PDVL   VPROJ
0704  REF  47  LAST 1316             11,3643  02152 C           ALPHAV
0705                                  11,3644  52361 1           VXSC   VSU
0706  REF   5  LAST 1308             11,3645  23707 C           3/4
0707                                  11,3646  60325 0           PDDL   NORM
0708                                  11,3647  00045 C           36D
0709  REF  37  LAST 1313             11,3650  00052 0           S2
0710                                  11,3651  63406 C           PUSH   DSQ
0711                                  11,3652  77605 1           DMP
0712                                  11,3653  65301 C           NORM   PDDL
0713                                  11,3654  00043 C           34D
0714  REF   6  LAST 1316             11,3655  02210 0           BETAM
0715                                  11,3656  56342 1           SR1    DDV
0716                                  11,3657  77761 1           VXSC
0717                                  11,3660  57154 C           LXA,2  XAD,2
0718  REF  38  LAST 1316             11,3661  00051 C           S2
0719  REF  39  LAST 1316             11,3662  00051 C           S2
0720                                  11,3663  57074 0           XAD,2  XAD,2
0721  REF  40  LAST 1316             11,3664  00051 C           S2
0722                                  11,3665  00042 1           34D
0723                                  11,3666  43457 0           VSL*   RVQ
```

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0724                          11,3667   57606 C                  0 -80,2
0725  REF   1                 11,2000                SETLOC ORBITAL1
0726                          11,3670                BANK

0727                          11,3670   04631 1  3/5   2DEC   .6 B-2
0727                          11,3671   23146 C
0728                          11,3672   14000 1  THREE/8 2DEC  .375
0728                          11,3673   00000 1
0729                          11,3674   02314 C  .3D    2DEC   .3 B-2
0729                          11,3675   31463 1
0730                          11,3676   01400 1  3/64  2DEC   3 B-6
0730                          11,3677   00000 1
0731                          11,3700   10000 0  DP1/4  2DEC   .25
0731                          11,3701   00000 1
0732  REF   2  LAST 1269     11,3700            QUARTER EQUALS DP1/4
0733  REF   3  LAST 1317     11,3700            POS1/4  EQUALS DP1/4
0734                          11,3702   03000 1  3/32  2DEC   3 B-5
0734                          11,3703   00000 1
0735                          11,3704   36000 1  15/16 2DEC   15. B -4
0735                          11,3705   00000 1
0736                          11,3706   30000 1  3/4   2DEC   3.0 B -2
0736                          11,3707   00000 1
0737                          11,3710   22525 0  7/12  2DEC   .5833333333
0737                          11,3711   12525 C
0738                          11,3712   22000 1  9/16  2DEC   9 B -4
0738                          11,3713   00000 1
0739                          11,3714   01200 1  5/128 2DEC   5 B-7
0739                          11,3715   00000 1
0740  REF  13  LAST 1311      04,3452            DPZERO  EQUALS ZEROVEC
0741                          11,3716   25252 C  DP2/3  2DEC   .6666666667
0741                          11,3717   25253 1
0742  REF   3  LAST 1312      11,3716            2/3     EQUALS DP2/3
07455                         11,3720   00027 1  OCT27   OCT    27
R0746  LR504 IS TEMPORARY
07462                         13,3712                BANK   13
07463 REF   1                 13,2000                SETLOC ORBITAL2
07464                         13,3712                BANK
R0747  IT IS VITAL THAT THE FOLLOWING CONSTANTS NOT BE SHUFFLED
0748                          13,3712   77764 1          DEC    -11
0749                          13,3713   77775 1          DEC    -2
0750                          13,3714   77766 C          DEC    -9
0751                          13,3715   77771 C          DEC    -6
0752                          13,3716   77775 1          DEC    -2
0753                          13,3717   77775 1          DEC    -2
0754                          13,3720   00000 1          DEC    0
0755                          13,3721   77763 C          DEC    -12
0756                          13,3722   77766 C          DEC    -9
0757                          13,3723   77773 1          DEC    -4
0758                          13,3724   77770 1  ASCALE  DEC    -7
0759                          13,3725   77771 0          DEC    -6
```

```
0760                    13,3726  27446 1          2DEC*  1.32715445 E16 B-54*     S
0760                    13,3727  14620 0
0761                    13,3730  16471 1          2DEC*  4.9027780 E8 B-30*       M
0761                    13,3731  01352 1
0762                    13,3732  22437 1  MUEARTH 2DEC*  3.986032 E10 B-36*
0762                    13,3733  16067 1
0763                    13,3734  00000 1          2DEC   0
0763                    13,3735  00000 1
0764                    13,3736  02302 1  J4REQ/J3 2DEC*  .4991607391 E7 B-26*
0764                    13,3737  24736 0
0765                    13,3740  00000 1          2DEC   0
0765                    13,3741  00000 1
0766                    13,3742  77776 1  2J3RE/J2 2DEC*  -.1355426363 E5 B-27*
0766                    13,3743  53032 0
0767                    13,3744  10407 0          2DEC*  .3067493316 E18 B-60*
0767                    13,3745  05344 1
0768                    13,3746  13710 0  J2REQSQ 2DEC*  1.75501139 E21 B-72*
0768                    13,3747  35320 0
0769                    13,3750  12160 0  3J22R2MU 2DEC*  9.20479048 E16 B-58*
0769                    13,3751  12124 0
0770                    13,3752  24000 1  5/8      2DEC   5 B-3
0770                    13,3753  00000 1
0771                    13,3754  74631 0  -1/12    2DEC   -.1
0771                    13,3755  63145 1
0772  REF  9 LAST 1316  13,3730           MUM      =      MUEARTH -2
0773                    13,3756  00243 1  RECRATIO 2DEC   .01
0773                    13,3757  32703 1
0774                    13,3760  03654 0  RSPHERE  2DEC   64373.76 E3 B-29
0774                    13,3761  21000 1
0775                    13,3762  03654 0  RDM      2DEC   16093.44 E3 B-27
0775                    13,3763  21000 1
0776                    13,3764  04627 0  RDE      2DEC   80467.20 E3 B-29
0776                    13,3765  25200 1
0777                       0000          RATT     EQUALS 0D
0778                       0006          VATT     EQUALS 6D
0779                       0014          TAT      EQUALS 12D
0780                       0016          RATT1    EQUALS 14D
0781                       0024          VATT1    EQUALS 20D
0782                       0032          MU(P)    EQUALS 26D
0783                       0040          TDEC1    EQUALS 32D
0784                       0016          URPV     EQUALS 14D
0785  REF  6 LAST 1307     0022          COSPHI/2 EQUALS URPV +4
0786                       0024          UZ       EQUALS 20D
0787                       0032          TVEC     EQUALS 26D
```

L INFLIGHT ALIGNMENT ROUTINES USER'S PAGE NO. 1 E0 S3

```
0001                          22,3505                 BANK   22
0002  REF   1                 23,2000                 SETLOC INFLIGHT
0003                          23,3140                 BANK

0004  REF  34  LAST  769      E5,1671                 EBANK= XSM


R0005  CALCGTA COMPUTES THE GYRO TORQUE ANGLES REQUIRED TO BRING THE STABLE MEMBER INTO THE DESIRED ORIENTATION.

R0007  THE INPUT IS THE DESIRED STABLE MEMBER COORDINATES REFERRED TO PRESENT STABLE MEMBER COORDINATES. THE THREE
R0009  HALF-UNIT VECTORS ARE STORED AT XDC, YDC, AND ZDC.

R0010  THE OUTPUTS ARE THE THREE GYRO TORQUING ANGLES TO BE APPLIED TO THE Y, Z, AND X GYROS AND ARE STORED DP AT IGC,
R0012  MGC, AND OGC RESPECTIVELY.

0013  REF   1                                         COUNT  23/INFLT

0014                          23,3140  71220 1  CALCGTA  ITA    DLOAD           PUSHDOWN  00-03,16D-27D,34D-37D
0015  REF  41  LAST 1316      23,3141  00051 0           ITA    S2              XDC = (XD1 XD2 XD3)
0016  REF   5  LAST  721      23,3142  02714 1           ITA    XDC             YDC = (YD1 YD2 YD3)
0017                          23,3143  65325 0           PDDL   PDDL            ZDC = (ZD1 ZD2 ZD3)
0018  REF  30  LAST 1217      23,3144  15332 1           ITA    HI6ZEROS
0019  REF   6  LAST 1319      23,3145  02720 0           ITA    XDC +4
0020                          23,3146  55476 1           DCOMP  VDEF
0021                          23,3147  77656 1           UNIT
0022  REF   1                 23,3150  14027 1           STODL  ZPRIME          ZP = UNIT(-XD3 0 XD1) = (ZP1 ZP2 ZP3)
0023  REF   2  LAST 1319      23,3151  00027 1           ITA    ZPRIME

0024                          23,3152  77742 0           SR1
0025  REF  10  LAST 1207      23,3153  14023 0           STODL  SINTH           SIN(IGC) = ZP1
0026  REF   3  LAST 1319      23,3154  00033 1           ITA    ZPRIME +4
0027                          23,3155  77742 0           SR1
0028  REF   9  LAST 1207      23,3156  34021 0           STCALL COSTH           COS(IGC) = ZP3
0029  REF   5  LAST  835      23,3157  47211 0           ITA    ARCTRIG

0030  REF   3  LAST  526      23,3160  16762 0           STODL  IGC             Y GYRO TORQUING ANGLE   FRACTION OF REV.
0031  REF   7  LAST 1319      23,3161  02716 0           ITA    XDC +2
0032                          23,3162  77742 0           SR1
0033  REF  11  LAST 1319      23,3163  14023 0           STODL  SINTH           SIN(MGC) = XD2
0034  REF   4  LAST 1319      23,3164  00027 1           ITA    ZPRIME

0035                          23,3165  65205 0           DMP    PDDL
0036  REF   8  LAST 1319      23,3166  02720 0           ITA    XDC +4          PDDO = (ZP1)(XD3)
0037  REF   9  LAST 1319      23,3167  00033 1           ITA    ZPRIME +4

0038                          23,3170  45205 1           DMP    DSU
0039  REF   9  LAST 1319      23,3171  02714 1           ITA    XDC             MPAC = (ZP3)(XD1)
0040                          23,3172  77626 0           STADR
0041  REF  10  LAST 1319      23,3173  43756 1           STCALL COSTH           COS(MGC) = MPAC - PDDO
0042  REF   6  LAST 1319      23,3174  47211 0           ITA    ARCTRIG
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0043  REF   3  LAST  526   23,3175   26764 C        STOVL  MGC          Z GYRO TORQUING ANGLE   FRACTION OF REV.
0044  REF   6  LAST 1319   23,3176   00027 1               ZPRIME
0045                        23,3177   77641 1        DOT
0046  REF   4  LAST  532   23,3200   02730 1               ZDC
0047  REF  11  LAST 1319   23,3201   24021 1        STOVL  COSTH         COS(OGC) = ZP . ZDC
0048  REF   7  LAST 1320   23,3202   00027 1               ZPRIME
0049                        23,3203   77641 1        DOT
0050  REF   4  LAST  532   23,3204   02722 1               YDC
0051  REF  12  LAST 1319   23,3205   34023 1        STCALL SINTH         SIN(OGC) = ZP . YDC
0052  REF   7  LAST 1319   23,3206   47211 C               ARCTRIG

0053  REF  17  LAST  711   23,3207   36760 C        STCALL OGC           X GYRO TORQUING ANGLE   FRACTION OF REV.
0054  REF  42  LAST 1319   23,3210   00051 C               S2
```

L INFLIGHT ALIGNMENT ROUTINES USER'S PAGE NO. 3 E5 S3

R0055 ARCTRIG COMPUTES AN ANGLE GIVEN THE SINE AND COSINE OF THIS ANGLE.

R0056 THE INPUTS ARE SIN/4 AND COS/4 STORED DP AT SINTH AND COSTH.

R0057 THE OUTPUT IS THE CALCULATED ANGLE BETWEEN +.5 AND -.5 REVOLUTIONS AND STORED AT THETA. THE OUTPUT IS ALSO
R0059 AVAILABLE AT MPAC.

```
0060                        23,3211  51545 1  ARCTRIG  DLOAD   ABS          PUSHDOWN  160-210
0061  REF  13  LAST 1320    23,3212  00023 0           SINTH
0062                        23,3213  50025 0           DSU     BMN
0063  REF   1               23,3214  07427 1           QTSN45               ABS(SIN/4) - SIN(45)/4
0064  REF   1               23,3215  47224 0           TRIG1                IF (-45,45) OR (135,-135)

0065                        23,3216  72545 0           DLOAD   SL1          (45,135) OR (-135,-45)
0066  REF  12  LAST 1320    23,3217  00021 1           COSTH
0067                        23,3220  75326 1           ACOS    SIGN
0068  REF  14  LAST 1321    23,3221  00023 0           SINTH
0069  REF   7  LAST 1207    23,3222  00025 0           STORE   THETA        X = ARCCOS(COS) WITH SIGN(SIN)
0070                        23,3223  77616 0           RVQ

0071                        23,3224  72545 0  TRIG1    DLOAD   SL1          (-45,45) OR (135,-135)
0072  REF  15  LAST 1321    23,3225  00023 0           SINTH
0073                        23,3226  77736 0           ASIN
0074  REF   8  LAST 1321    23,3227  14025 0           STODL   THETA        X = ARCSIN(SIN) WITH SIGN(SIN)
0075  REF  13  LAST 1321    23,3230  00021 1           COSTH
0076                        23,3231  77640 0           BMN
0077  REF   1               23,3232  47235 0           TRIG2                IF (135,-135)

0078                        23,3233  43545 1           DLOAD   RVQ
0079  REF   9  LAST 1321    23,3234  00025 0           THETA                X = ARCSIN(SIN)     (-45,45)

0080                        23,3235  75345 1  TRIG2    DLOAD   SIGN         (135,-135)
0081  REF  12  LAST 1216    23,3236  15330 0           HIDPHALF
0082  REF  16  LAST 1321    23,3237  00023 0           SINTH
0083                        23,3240  77625 0           DSU
0084  REF  10  LAST 1321    23,3241  00025 0           THETA
0085  REF  11  LAST 1321    23,3242  00025 0           STORE   THETA        X = .5 WITH SIGN(SIN) - ARCSIN(SIN)
0086                        23,3243  77616 0           RVQ                                (+) - (+) OR (-) - (-)
```

L INFLIGHT ALIGNMENT ROUTINES

R0087 SMNB, MBSM, AND AXISRCT, WHICH USED TO APPEAR HERE, HAVE BEEN
R0088 COMBINED IN A ROUTINE CALLED AX*SR*T, WHICH APPEARS AMONG THE POWERED
R0089 FLIGHT SUBROUTINES.

R0090 CALCGA COMPUTES THE CDU DRIVING ANGLES REQUIRED TO BRING THE STABLE MEMBER INTO THE DESIRED ORIENTATION.

R0092 THE INPUTS ARE 1) THE NAVIGATION BASE COORDINATES REFERRED TO ANY COORDINATE SYSTEM. THE THREE HALF-UNIT
R0094 VECTORS ARE STORED AT XNB,YNB, AND ZNB. 2) THE DESIRED STABLE MEMBER COORDINATES REFERRED TO THE SAME
R0096 COORDINATE SYSTEM ARE STORED AT XSM, YSM, AND ZSM.

R0097 THE OUTPUTS ARE THE THREE CDU DRIVING ANGLES AND ARE STORED SP AT THETAD, THETAD +1, AND THETAD +2.

```
0099                          23,3244  77601 C  CALCGA  SETPD                PUSHDOWN  00-05, 16D-21D, 34D-37D
0100                          23,3245  00001 C                   0
0101                          23,3246  47375 C          VLOAD    VXV
0102  REF  10  LAST  769     23,3247  02714 1                   XNB          XNB = OGA (OUTER GIMBAL AXIS)
0103  REF   5  LAST  769     23,3250  02700 1                   YSM          YSM = IGA (INNER GIMBAL AXIS)
0104                          23,3251  41456 C          UNIT     PUSH         PDO = UNIT(OGA X IGA) = MGA

0105                          23,3252  44041 1          DOT      ITA
0106  REF   7  LAST  769     23,3253  02730 1                   ZNB
0107  REF  43  LAST 1320     23,3254  00051 C                   S2
0108  REF  14  LAST 1321     23,3255  24021 1          STOVL    COSTH        COS(OG) = MGA . ZNB
0109                          23,3256  00001 C                   0
0110                          23,3257  77641 1          DOT
0111  REF   7  LAST  769     23,3260  02722 1                   YNB
0112  REF  17  LAST 1321     23,3261  34023 1          STCALL   SINTH        SIN(OG) = MGA . YNB
0113  REF   8  LAST 1320     23,3262  47211 C                   ARCTRIG
0114  REF  18  LAST 1320     23,3263  26760 1          STOVL    OGC
0115                          23,3264  00001 C                   0

0116                          23,3265  50235 C          VXV      DOT          PROVISION FOR MG ANGLE OF 90 DEGREES
0117  REF  11  LAST 1323     23,3266  02714 1                   XNB
0118  REF   6  LAST 1323     23,3267  02700 1                   YSM
0119                          23,3270  77752 1          SL1
0120  REF  15  LAST 1323     23,3271  24021 1          STOVL    COSTH        COS(MG) = IGA . (MGA X OGA)
0121  REF   7  LAST 1323     23,3272  02700 1                   YSM
0122                          23,3273  77641 1          DOT
0123  REF  12  LAST 1323     23,3274  02714 1                   XNB
0124  REF  18  LAST 1323     23,3275  34023 1          STCALL   SINTH        SIN(MG) = IGA . OGA
0125  REF   9  LAST 1323     23,3276  47211 C                   ARCTRIG
0126  REF   4  LAST 1320     23,3277  02764 C          STORE    MGC

0127                          23,3300  45246 C          ABS      DSU
0128  REF   1                 23,3301  07431 C                   .166...
0129                          23,3302  77644 1          BPL
0130  REF   1                 23,3303  47324 1                   GIMLCCK1     IF ANGLE GREATER THAN 60 DEGREES

0131                          23,3304  50375 C  CALCGA1  VLOAD    DOT
0132  REF   4  LAST  769     23,3305  02706 1                   ZSM
0133                          23,3306  00001 C                   0
0134  REF  16  LAST 1323     23,3307  24021 1          STOVL    COSTH        COS(IG) = ZSM . MGA
0135  REF  35  LAST 1319     23,3310  02672 C                   XSM
```

0136				23,3311	45441 1		DOT	STADR	
0137	REF	19	LAST 1323	23,3312	43754 0		STCALL	SINTH	SIN(IG) = XSM . MGA
0138	REF	10	LAST 1323	23,3313	47211 0			ARCTRIG	
0139	REF	4	LAST 1319	23,3314	26762 0		STOVL	IGC	
0140	REF	19	LAST 1323	23,3315	02760 1			OGC	
0141				23,3316	43034 1		RTB	BONCLR	
01415	REF	5	LAST 533	23,3317	45547 0			V1STO2S	
0142	REF	2	LAST 769	23,3320	00200 0			CPHIFLAG	
01425	REF	44	LAST 1323	23,3321	00051 0			S2	
0143	REF	20	LAST 719	23,3322	35156 0		STCALL	THETAD	
0144	REF	45	LAST 1324	23,3323	00051 0			S2	
0145				23,3324	77776 1	GIMLOCK1	EXIT		
0146	REF	35	LAST 1314	23,3325	0 5537 0		TC	ALARM	
0147				23,3326	00401 1		OCT	00401	
0148	REF	51	LAST 1313	23,3327	0 5435 0		TC	UPFLAG	GIMBAL LOCK HAS OCCURED
0149	REF	2	LAST 415	23,3330	00056 1		ADRES	GLOKFAIL	
0150	REF	242	LAST 1314	23,3331	0 6006 1		TC	INTPRET	
0151				23,3332	77650 1		GOTO		
0152	REF	1		23,3333	47304 0			CALCGA1	

L INFLIGHT ALIGNMENT ROUTINES USER'S PAGE NO. 7 E5 S3

R0153 AXISGEN COMPUTES THE COORDINATES OF ONE COORDINATE SYSTEM REFERRED TO ANOTHER COORDINATE SYSTEM.

R0155 THE INPUTS ARE 1) THE STAR1 VECTOR REFERRED TO COORDINATE SYSTEM A STORED AT STARAD. 2) THE STAR2 VECTOR
R0157 REFERRED TO COORDINATE SYSTEM A STORED AT STARAD +6. 3) THE STAR1 VECTOR REFERRED TO COORDINATE SYSTEM B STORED
R0159 AT LOCATION 6 OF THE VAC AREA. 4) THE STAR2 VECTOR REFERRED TO COORDINATE SYSTEM B STORED AT LOCATION 12D OF
R0161 THE VAC AREA.

R0162 THE OUTPUT DEFINES COORDINATE SYSTEM A REFERRED TO COORDINATE SYSTEM B. THE THREE HALF-UNIT VECTORS ARE STORED
R0164 AT LOCATIONS XDC, XDC +6, XDC +12D, AND STARAD, STARAD +6, STARAD +12D.

```
0165                        23,3334  66370 C  AXISGEN  AXT,1   SSP              PUSHDOWN  00-30D,34D-37D
0166  REF  11  LAST  735    23,3335  02743 C                    STARAD +6
0167  REF  54  LAST 1306    23,3336  00051 C                    S1
0168  REF  12  LAST 1325    23,3337  02727 1                    STARAD -6

0169                        23,3340  77601 C            SETPD
0170                        23,3341  00001 C                    0
0171                        23,3342  46773 C  AXISGEN1 VLOAD*   VXV*             06D   UA = S1
0172  REF  13  LAST 1325    23,3343  02752 C                    STARAD +12D,1          STARAD +00D   UB = S1
0173  REF  14  LAST 1325    23,3344  02760 1                    STARAD +18D,1
0174                        23,3345  77656 1            UNIT                     12D   VA = UNIT(S1 X S2)
0175  REF  15  LAST 1325    23,3346  06760 C            STORE   STARAD +18D,1          STARAD +06D   VB = UNIT(S1 X S2)
0176                        23,3347  77773 1            VLOAD*
0177  REF  16  LAST 1325    23,3350  02752 C                    STARAD +12D,1

0178                        23,3351  76433 1            VXV*    VSL1
0179  REF  17  LAST 1325    23,3352  02760 1                    STARAD +18D,1    18D   WA = UA X VA
0180  REF  18  LAST 1325    23,3353  06766 C            STORE   STARAD +24D,1          STARAD +12D   WB = UB X VB

0181                        23,3354  77700 C            TIX,1
0182  REF   1               23,3355  47342 1                    AXISGEN1

0183                        23,3356  66160 C            AXC,1   SXA,1
0184                        23,3357  00006 1                    6
0185                        23,3360  00036 1                    30D

0186                        23,3361  66370 C            AXT,1   SSP
0187                        23,3362  00022 1                    18D
0188  REF  55  LAST 1325    23,3363  00051 C                    S1
0189                        23,3364  00006 1                    6

0190                        23,3365  66374 1            AXT,2   SSP
0191                        23,3366  00006 1                    6
0192  REF  46  LAST 1324    23,3367  00052 C                    S2
0193                        23,3370  00002 C                    2

0194                        23,3371  76720 C  AXISGEN2 XCHX,1  VLOAD*
0195                        23,3372  00036 1                    30D              X1=-6 X2=+6   X1=-6 X2=+4   X1=-6 X2=+2
0196                        23,3373  00001 C                    0,1
```

```
0197                          23,3374  62757 C          VXSC*  PDVL*          J=(UA)(UB1)   J=(UA)(UB2)   J=(UA)(UB3)
0198  REF  19  LAST 1325      23,3375  75033 C                 STARAD +6,2
0199                          23,3376  00007 C                 6,1
0200                          23,3377  77757 1          VXSC*
0201  REF  20  LAST 1326      23,3400  75025 1                 STARAD +120,2
0202                          23,3401  30031 C          STOVL* 24D             K=(VA)(VB1)   J=(VA)(VB2)   J=(VA)(VB3)
0203                          23,3402  00015 C                 12D,1

0204                          23,3403  53357 C          VXSC*  VAD
0205  REF  21  LAST 1326      23,3404  75017 C                 STARAD +180,2  L=(WA)(WB1)   J=(WA)(WB2)   J=(WA)(WB3)
0206                          23,3405  76455 1          VAD    VSL1
0207                          23,3406  00031 C                 24D
0208                          23,3407  53520 C          XCHX,1 UNIT
0209                          23,3410  00036 1                 30D
0210  REF  10  LAST 1319      23,3411  06736 C          STORE  XDC +180,1     XDC = L+J+K   YDC = L+J+K   ZDC = L+J+K

0211                          23,3412  77700 C          TIX,1
0212  REF   1                 23,3413  47414 C                 AXISGEN3

0213                          23,3414  77704 1  AXISGEN3 TIX,2
0214  REF   1                 23,3415  47371 1                 AXISGEN2

0215                          23,3416  77775 1          VLOAD
0216  REF  11  LAST 1326      23,3417  02714 1                 XDC
0217  REF  22  LAST 1326      23,3420  26736 1          STOVL  STARAD
0218  REF   5  LAST 1320      23,3421  02722 1                 YDC
0219  REF  23  LAST 1326      23,3422  26744 1          STOVL  STARAD +6
0220  REF   5  LAST 1320      23,3423  02730 1                 ZDC
0221  REF  24  LAST 1326      23,3424  02752 C          STORE  STARAD +120

0222                          23,3425  77616 C          RVQ
```

```
0281                23,3426   05520 C  QTSN45   2DEC   .1768
0281                23,3427   26075 1
0282                23,3430   05252 1  .166...  2DEC   .1666666667
0282                23,3431   25253 1
```

L INFLIGHT ALIGNMENT ROUTINES

L POWERED FLIGHT SUBROUTINES USER'S PAGE NO. 1 EQ S3

```
0001                        14,3412          BANK   14              SAME FBANK AS THE FINDCDUD SUB-PROGRAM
0002  REF   1               23,2000          SETLOC POWFLITE
0003                        23,3432          BANK

0004  REF   1                 0142           EBANK= DEXDEX
0005  REF   1                                COUNT* $$/POWFL

R0006       CDUTRIG, CDUTRIG1, CDUTRIG2, AND CD*TR*GS ALL COMPUTE THE SINES AND
R0007  COSINES OF THREE 2'S COMPLEMENT ANGLES AND PLACE THE RESULT, DOUBLE
R0008  PRECISION, IN THE SAME ORDER AS THE INPUTS, AT SINCDU AND COSCDU.  AN
R0009  ADDITIONAL OUTPUT IS THE 1'S COMPLEMENT ANGLES AT CDUSPOT.  THESE
R0010  ROUTINES GO OUT OF THEIR WAY TO LEAVE THE MPAC AREA AS THEY FIND IT,
R0011  EXCEPT FOR THE GENERALLY UNIMPORTANT MPAC +2.  THEY DIFFER ONLY IN
R0012  WHERE THEY GET THE ANGLES, AND IN METHOD OF CALLING.

R0013       CDUTRIG (AND CDUTRIG1, WHICH CAN BE CALLED IN BASIC) COMPUTE THE
R0014  SINES AND COSINES FROM THE CURRENT CONTENTS OF THE CDU REGISTERS.
R0015  THE CONTENTS OF CDUTEMP, ETC., ARE NOT TOUCHED SO THAT THEY MAY
R0016  CONTINUE TO FORM A CONSISTENT SET WITH THE LATEST PIPA READINGS.

R0017       CDUTRIG1 IS LIKE CDUTRIG EXCEPT THAT IT CAN BE CALLED IN BASIC.

R0018       CD*TR*GS FINDS CDU VALUES IN CDUSPOT RATHER THAN IN CDUTEMP.  THIS
R0019  ALLOWS USERS TO MAKE TRANSFORMATIONS USING ARBITRARY ANGLES, OR REAL
R0020  ANGLES IN AN ORDER OTHER THAN X Y Z.  A CALL TO THIS ROUTINE IS
R0021  NECESSARY IN PREPARATION FOR A CALL TO AX*SR*T IN EITHER OF ITS TWO
R0022  MODES (SMNB OR NBSM).  SINCE AX*SR*T EXPECTS TO FIND THE SINES AND
R0023  COSINES IN THE ORDER Y Z X THE ANGLES MUST HAVE BEEN PLACED IN CDUSPOT
R0024  IN THIS ORDER.  CD*TR*GS NEED NOT BE REPEATED WHEN AX*SR*T IS CALLED
R0025  MORE THAN ONCE, PROVIDED THE ANGLES HAVE NOT CHANGED.  NOTE THAT SINCE
R0026  IT CLOBBERS BUF2 (IN THE SINE AND COSINE ROUTINES) CD*TR*GS CANNOT BE
R0027  CALLED USING BANKCALL.  SORRY.

R0028       CD*TR*G IS LIKE CD*TR*GS EXCEPT THAT IT CAN BE CALLED IN
R0029  INTERPRETIVE.

0030                        23,3432   77776 1  CDUTRIG  EXIT
0031  REF   1               23,3433   0 3442 0           TC      CDUTRIGS
0032  REF 243  LAST 1324    23,3434   0 6006 1           TC      INTPRET
0033                        23,3435   77616 0            RVQ

0034                        23,3436   77776 1  CD*TR*G  EXIT
0035  REF   1               23,3437   0 3450 0           TC      CD*TR*GS
0036  REF 244  LAST 1329    23,3440   0 6006 1           TC      INTPRET
0037                        23,3441   77616 0            RVQ

0038  REF  28  LAST 1031    23,3442   3 0032 0  CDUTRIGS CA      CDUX
0039  REF   6  LAST  533    23,3443   54 772 1           TS      CDUSPOT +4
0040  REF  16  LAST 1031    23,3444   3 0033 1           CA      CDUY
0041  REF   7  LAST 1329    23,3445   54 766 1           TS      CDUSPOT
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0042  REF  22  LAST 1031   23,3446  3 0034 C          CA      CDUZ
0043  REF   8  LAST 1329   23,3447  54 770 C          TS      CDUSPCT +2

0044                       23,3450  0 0006 1  CD*TR*GS EXTEND
0045  REF   4  LAST   68   23,3451  22 142 C          QXCH    TEM2
0046  REF  17  LAST 1149   23,3452  3 4710 C          CAF     FOUR
0047  REF  37  LAST 1119   23,3453  7 6211 1  TR*GL**P MASK    SIX       MAKE IT EVEN AND SMALLER
0048  REF   3  LAST   68   23,3454  54 143 C          TS      TEM3
0049  REF   4  LAST 1330   23,3455  50 143 1          INDEX   TEM3
0050  REF   9  LAST 1330   23,3456  3 0766 C          CA      CDUSPCT
0051  REF 660  LAST 1307   23,3457  52 155 1          DXCH    MPAC      STORING 2'S COMP ANGLE, LOADING MPAC
0052  REF  53  LAST 1145   23,3460  52 127 1          DXCH    VBUF +4   STORING MPAC FOR LATER RESTORATION
0053  REF   1              23,3461  0 4652 1          TC      USPRCADR
0054  REF  10  LAST  834   23,3462   45510 1          CADR    COULOGIC
0055                       23,3463  0 0006 1          EXTEND
0056  REF 661  LAST 1330   23,3464  3 0155 0          DCA     MPAC
0057  REF   5  LAST 1330   23,3465  50 143 1          INDEX   TEM3
0058  REF  10  LAST 1330   23,3466  52 767 C          DXCH    CDUSPCT   STORING 1'S COMPLEMENT ANGLE
0059  REF   2  LAST 1330   23,3467  0 4652 1          TC      USPRCADR
0060  REF   2  LAST 1085   23,3470   01516 1          CADR    COSINE
0061  REF 662  LAST 1330   23,3471  52 155 1          DXCH    MPAC
0062  REF   6  LAST 1330   23,3472  50 143 1          INDEX   TEM3
0063  REF   4  LAST   71   23,3473  52 745 C          DXCH    COSCDU    STORING COSINE
0064                       23,3474  0 0006 1          EXTEND
0065  REF   7  LAST 1330   23,3475  5 0143 1          INDEX   TEM3
0066  REF  11  LAST 1330   23,3476  3 0767 1          DCA     CDUSPOT   LOADING 1'S COMPLEMENT ANGLE
0067  REF   3  LAST 1330   23,3477  0 4652 1          TC      USPRCADR
0068  REF   2  LAST 1089   23,3500   01530 C          CADR    SINE +1   SINE +1 EXPECTS ARGUMENT IN A AND L
0069  REF  54  LAST 1330   23,3501  52 127 1          DXCH    VBUF +4   BRINGING UP PRIOR MPAC TO BE RESTORED
0070  REF 663  LAST 1330   23,3502  52 155 1          DXCH    MPAC
0071  REF   8  LAST 1330   23,3503  50 143 1          INDEX   TEM3
0072  REF   4  LAST   71   23,3504  52 737 C          DXCH    SINCDU
0073  REF   9  LAST 1330   23,3505  10 143 C          CCS     TEM3
0074  REF   1              23,3506  1 3453 1          TCF     TR*GL**P
0075  REF   5  LAST 1330   23,3507  0 0142 C          TC      TEM2
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P0076  ********************************************************************************************************************

R0078       QUICTRIG, INTENDED FOR GUIDANCE CYCLE USE WHERE TIME IS CRITICAL, IS A MUCH FASTER VERSION OF CD*TR*GS.
R0080  QUICTRIG COMPUTES AND STORES THE SINES AND COSINES OF THE 2'S COMPLEMENT ANGLES AT CDUSPOT, CDUSPOT +2,
R0082  AND CDUSPOT +4.  UNLIKE CD*TR*GS, QUICTRIG DOES NOT LEAVE THE 1'S COMPLEMENT VERSIONS OF THE ANGLES IN
R0084  CDUSPOT.  QUICTRIG'S EXECUTION TIME IS 4.1 MS;  THIS IS 10 TIMES AS FAST AS CD*TR*GS.  QUICTRIG MAY BE
R0086  CALLED FROM INTERPRETIVE AS AN RTB OP-CODE, OR FROM BASIC VIA BANKCALL OR IBNKCALL.

 0090                              23,3510  0 0004 C  QUICTRIG INHINT                INHINT SINCE CAP USES THE SAME TEMPS
 00901                             23,3511  0 0006 1           EXTEND
 00902  REF  11  LAST  224         23,3512  22 061 C           QXCH    ITEMP1
 0091   REF  18  LAST 133C         23,3513  3 4710 C           CAF     FOUR
 0092   REF  38  LAST 133C         23,3514  7 6211 1     +4    MASK    SIX
 0093   REF  10  LAST  222         23,3515  54 062 1           TS      ITEMP2
 0094   REF  11  LAST 1331         23,3516  50 062 C           INDEX   ITEMP2
 0095   REF  12  LAST 133C         23,3517  3 0766 C           CA      CDUSPOT
 0096   REF   8  LAST 1041         23,3520  0 4770 C           TC      SPSIN
 0097                              23,3521  0 0006 1           EXTEND
 0098   REF  73  LAST 1202         23,3522  7 4675 C           MP      BIT14           SCALE DOWN TO MATCH INTERPRETER OUTPUTS
 0099   REF  12  LAST 1331         23,3523  50 062 C           INDEX   ITEMP2
 0100   REF   5  LAST 133C         23,3524  52 737 C           DXCH    SINCDU
 0101   REF  13  LAST 1331         23,3525  50 062 C           INDEX   ITEMP2
 0102   REF  13  LAST 1331         23,3526  3 0766 C           CA      CDUSPOT
 0103   REF   7  LAST 1041         23,3527  0 4767 C           TC      SPCOS
 0104                              23,3530  0 0006 1           EXTEND
 0105   REF  74  LAST 1331         23,3531  7 4675 C           MP      BIT14
 0106   REF  14  LAST 1331         23,3532  50 062 C           INDEX   ITEMP2
 0107   REF   5  LAST 133C         23,3533  52 745 C           DXCH    COSCDU
 0108   REF  15  LAST 1331         23,3534  10 062 1           CCS     ITEMP2
 0109   REF   2  LAST  65E         23,3535  1 3514 C           TCF     QUICTRIG +4
 01091  REF  12  LAST 1331         23,3536  3 0061 C           CA      ITEMP1
 0110                              23,3537  0 0003 1           RELINT
 01101  REF 337  LAST 129C         23,3540  0 0000 1           TC      A
```

R0111 **

R0113 THESE INTERFACE ROUTINES MAKE IT POSSIBLE TO CALL AX*SR*T, ETC., IN
R0114 INTERPRETIVE. LATER, WHERE POSSIBLE, THEY WILL BE ELIMINATED.

R0115 NBSM WILL BE THE FIRST TO GO. IT SHOULD NOT BE USED.

```
0116                          23,3541   77620 0  NBSM     STQ
0117  REF  37  LAST 1307     23,3542   00047 1                X2
0118                          23,3543   76740 0           LXC,1  VLOAD*
0119  REF  56  LAST 1325     23,3544   00050 1                S1          BASE ADDRESS OF THE CDU ANGLES IS IN S1
0120                          23,3545   00001 0                0,1
0121  REF  14  LAST 1331     23,3546   24767 1           STOVL  CDUSPOT
0122                          23,3547   00041 1                32D         VECTOR TO BE TRANSFORMED IS IN 32D
0123                          23,3550   77624 1           CALL
0124  REF   2  LAST  445     23,3551   47572 1                TRG*NBSM
0125                          23,3552   34041 0           STCALL 32D        SINCE THERE'S NO STGOTO
0126  REF  38  LAST 1332     23,3553   00047 1                X2
```

R0127 THESE INTERFACE ROUTINES ARE PERMANENT. ALL RESTORE USER'S EBANK
R0128 SETTING. ALL ARE STRICT INTERPRETIVE SUBROUTINES, CALLED USING "CALL",
R0129 RETURNING VIA QPRET. ALL EXPECT AND RETURN THE VECTOR TO BE TRANSFOR-
R0130 MED INTERPRETER-STYLE IN MPAC; COMPONENTS AT MPAC, MPAC +3, AND MPAC +5.

R0131 TRG*SMNB AND TRG*NBSM BOTH EXPECT TO SEE THE 2'S COMPLEMENT ANGLES
R0132 AT CDUSPOT (ORDER Y Z X, AT CDUSPOT, CDUSPOT +2, AND CDUSPOT +4; ODD
R0133 LOCATIONS NEED NOT BE ZEROED). TRG*NBSM DOES THE NB TO SM TRANSFOR-
R0134 MATION; TRG*SMNB, VICE VERSA.

R0135 CDU*NBSM DOES ITS TRANSFORMATION USING THE PRESENT CONTENTS OF
R0136 THE CDU COUNTERS. OTHERWISE IT IS LIKE TRG*NBSM.

R01361 CDU*SMNB IS THE COMPLEMENT OF CDU*NBSM.

```
01362                         23,3554   77776 1  CDU*SMNB EXIT
01363  REF   2  LAST 1329     23,3555   0 3442 0           TC     CDUTRIGS
01364  REF   1                23,3556   1 3561 1           TCF    C*MM*N1

0137                          23,3557   77776 1  TRG*SMNB EXIT
0138   REF   2  LAST 1329     23,3560   0 3450 0           TC     CD*TR*GS
0139   REF   3  LAST 1142     23,3561   0 7501 1  C*MM*N1  TC     MPACVBUF    AX*SR*T EXPECTS VECTOR IN VBUF
0140   REF  42  LAST 1171     23,3562   4 6214 1           CS     THREE       SIGNAL FOR SM TO NB TRANSFORMATION
0141   REF   1                23,3563   0 3603 1  C*MM*N2  TC     AX*SR*T
0142   REF 245  LAST 1329     23,3564   0 6006 1           TC     INTPRET
0143                          23,3565    43575 1           VLOAD  RVQ
0144   REF  55  LAST 1330     23,3566    00123 1                  VBUF

0145                          23,3567   77776 1  CDU*NBSM EXIT
0146   REF   3  LAST 1332     23,3570   0 3442 0           TC     CDUTRIGS
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0147  REF  1                23,3571  1 3574 C            TCF    C*MM*N3

0148                        23,3572   77776 1  TRG*NBSM EXIT
0149  REF  3  LAST 1332    23,3573   0 3450 C            TC     CD*TR*GS
0150  REF  4  LAST 1332    23,3574   C 7501 1  C*MM*N3   TC     MPACVBUF        FOR AX*SR*T
0151  REF 43  LAST 1332    23,3575   3 6214 C            CA     THREE           SIGNAL FOR NB TO SM TRANSFORMATION
0152  REF  1                23,3576   1 3563 C            TCF    C*MM*N2

R0153       *NBSM* AND *SMNB* EXPECT TO SEE THE SINES AND COSINES (AT SINCDU
R0154  AND COSCDU) RATHER THAN THE ANGLES THEMSELVES.  OTHERWISE THEY ARE
R0155  LIKE TRG*NBSM AND TRG*SMNB.

R0156       NOTE THAT JUST AS CD*TR*GS NEED BE CALLED ONLY ONCE FOR EACH SERIES
R0157  OF TRANSFORMATIONS USING THE SAME ANGLES, SO TOO ONLY ONE OF TRG*NBSM
R0158  AND TRG*SMNB NEED BE CALLED FOR EACH SERIES.  FOR SUBSEQUENT TRANSFOR-
R0159  MATIONS USE *NBSM* AND *SMNB*.

0160                        23,3577   77776 1  *SMNB*   EXIT
0161  REF  2  LAST 1332    23,3600   1 3561 1            TCF    C*MM*N1

0162                        23,3601   77776 1  *NBSM*   EXIT
0163  REF  2  LAST 1333    23,3602   1 3574 C            TCF    C*MM*N3

R0164       AX*SR*T COMBINES THE OLD SMNB AND NBSM.  FOR THE NB TO SM
R0165  TRANSFORMATION, ENTER WITH +3 IN A.  FOR SM TO NB, ENTER WITH -3.
R0166  THE VECTOR TO BE TRANSFORMED ARRIVES, AND IS RETURNED, IN VBUF.
R0167  AX*SR*T EXPECTS TO FIND THE SINES AND COSINES OF THE ANGLES OF ROTATION
R0168  AT SINCDU AND COSCDU, IN THE ORDER Y Z X.  A CALL TO CD*TR*GS, WITH
R0169  THE 2'S COMPLEMENT ANGLES (ORDER Y Z X) AT CDUSPOT, WILL TAKE CARE OF
R0170  THIS.  HERE IS A SAMPLE CALLING SEQUENCE:-

R0171                             TC     CDUTRIGS
R0172                             CS     THREE        ("CA  THREE" FOR NBSM)
R0173                             TC     AX*SR*T

R0174  THE CALL TO CD*TR*GS NEED NOT BE REPEATED, WHEN AX*SR*T IS CALLED MORE
R0175  THAN ONCE, UNLESS THE ANGLES HAVE CHANGED.

R0176       AX*SR*T IS GUARANTEED SAFE ONLY FOR VECTORS OF MAGNITUDE LESS THAN
R0177  UNITY.  A LOOK AT THE CASE IN WHICH A VECTOR OF GREATER MAGNITUDE
R0178  HAPPENS TO LIE ALONG AN AXIS OF THE SYSTEM TO WHICH IT IS TO BE TRANS-
R0179  FORMED CONVINCES ONE THAT THIS IS A RESTRICTION WHICH MUST BE ACCEPTED.

0180  REF  2  LAST 1329    23,3603   54 142 1  AX*SR*T  TS     DEXDEX          WHERE IT BECOMES THE INDEX OF INDEXES
0181                        23,3604   0 0006 1            EXTEND
0182  REF  1                23,3605   22 145 1            QXCH   RTNSAVER

0183  REF  3  LAST 1333    23,3606   10 142 1  R*TL**P   CCS    DEXDEX                  +3 --> 0     -3 --> 2
0184  REF  4  LAST 1333    23,3607   4 0142 1            CS     DEXDEX          THUS:   +2 --> 1     -2 --> 1
0185  REF 44  LAST 1333    23,3610   6 6214 C            AD     THREE                   +1 --> 2     -1 --> 0
```

```
0186                          23,3611  0 0006 1          EXTEND
0187  REF 338  LAST 1331      23,3612  5 0000 1          INDEX  A
0188  REF   1                 23,3613  3 3672 1          DCA    INDEXI
0189  REF   1                 23,3614  52 144 1          DXCH   DEXI

0190  REF 156  LAST 1291      23,3615  3 4712 1          CA     ONE
0191  REF 122  LAST 1186      23,3616  54 130 1          TS     BUF
0192                          23,3617  0 0006 1          EXTEND
0193  REF   2  LAST   68      23,3620  5 0143 1          INDEX  DEX1
0194  REF  56  LAST 1332      23,3621  4 0123 0          DCS    VBUF
0195  REF   1                 23,3622  1 3624 0          TCF    LOOP1          REALLY BE A SUBTRACT, AND VICE VERSA

0196  REF 123  LAST 1334      23,3623  52 131 0  LOOP2   DXCH   BUF            LOADING VECTOR COMPONENT, STORING INDEX

0197  REF 664  LAST 133C      23,3624  52 155 1  LOOP1   DXCH   MPAC
0198  REF   1                 23,3625  3 3670 0          CA     SINESLOC
0199  REF   3  LAST 1334      23,3626  6 0143 1          AD     DEX1
0200  REF  78  LAST 1148      23,3627  54 116 0          TS     ADDRWD

0201  REF  21  LAST 1157      23,3630  0 7056 0          TC     DMPSUB         MULTIPLY BY SIN(CDUANGLE)
0202  REF   5  LAST 1333      23,3631  10 142 1          CCS    DEXDEX
0203  REF 665  LAST 1334      23,3632  52 155 1          DXCH   MPAC           NBSM CASE
0204                          23,3633  1 3636 0          TCF    +3
0205                          23,3634  0 0006 1          EXTEND                SMNB CASE
0206  REF 666  LAST 1334      23,3635  4 0155 1          DCS    MPAC
0207  REF   1                 23,3636  52 134 0          DXCH   TERMITMP

0208  REF  39  LAST 1331      23,3637  3 6211 0          CA     SIX            SINCDU AND COSCDU (EACH 6 WORDS) MUST
0209  REF  79  LAST 1334      23,3640  26 116 0          ADS    ADDRWD           BE CONSECUTIVE AND IN THAT ORDER

0210                          23,3641  0 0006 1          EXTEND
0211  REF 124  LAST 1334      23,3642  5 0130 0          INDEX  BUF
0212  REF   4  LAST 1334      23,3643  5 0143 1          INDEX  DEX1
0213  REF  57  LAST 1334      23,3644  3 0123 1          DCA    VBUF
0214  REF 667  LAST 1334      23,3645  52 155 1          DXCH   MPAC
0215  REF  22  LAST 1334      23,3646  0 7056 0          TC     DMPSUB         MULTIPLY BY COS(CDUANGLE)
0216  REF 668  LAST 1334      23,3647  52 155 1          DXCH   MPAC
0217  REF   2  LAST 1334      23,3650  20 134 0          DAS    TERMITMP
0218  REF   3  LAST 1334      23,3651  52 134 0          DXCH   TERMITMP
0219                          23,3652  20 001 1          DDOUBL
0220  REF 125  LAST 1334      23,3653  50 130 0          INDEX  BUF
0221  REF   5  LAST 1334      23,3654  50 143 1          INDEX  DEX1
0222  REF  58  LAST 1334      23,3655  52 123 0          DXCH   VBUF
0223  REF 126  LAST 1334      23,3656  52 131 0          DXCH   BUF            LOADING INDEX, STORING VECTOR COMPONENT

0224  REF 339  LAST 1334      23,3657  10 000 0          CCS    A              'CAUSE THAT'S WHERE THE INDEX NOW IS
0225  REF   1                 23,3660  1 3623 1          TCF    LOOP2

0226                          23,3661  0 0006 1          EXTEND
0227  REF   6  LAST 1334      23,3662  26 142 1          DIM    DEXDEX         DECREMENT MAGNITUDE PRESERVING SIGN
```

L POWERED FLIGHT SUBROUTINES USER'S PAGE NO. 7 EQ S3

```
0228   REF   7  LAST 1334   23,3663   10 142 1  TSTPOINT CCS     DEXDEX          ONLY THE BRANCHING FUNCTION IS USED
0229   REF   1               23,3664   1 3606 0            TCF     R*TL**P
0230   REF   2  LAST 1333   23,3665   0 0145 1            TC      RTNSAVER
0231   REF   2  LAST 1335   23,3666   1 3606 0            TCF     R*TL**P
0232   REF   3  LAST 1335   23,3667   0 0145 1            TC      RTNSAVER

0233   REF   6  LAST 1331   23,3670   00736 0  SINESLOC ADRES   SINCDU          FOR USE IN SETTING ADDRWD

0234                         23,3671   00004 0  INDEXI   DEC     4              ********** DON'T **********
0235                         23,3672   00002 0           DEC     2              ********** TOUCH **********
0236                         23,3673   00000 1           DEC     0              ********** THESE **********
0237                         23,3674   00004 0           DEC     4              ********** CONSTANTS **********

R0238  ************************************************************************************************************************
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L POWERED FLIGHT SUBROUTINES USER'S PAGE NO. 8 EO S3

P0240 THIS SUBROUTINE COMPUTES INCREMENTAL CHANGES IN CDU(GIMBAL) ANGLES FROM INCREMENTAL CHANGES ABOUT SM AXES. IT
R0242 REQUIRES SM INCREMENTS AS A DP VECTOR SCALED AT ONE REVOLUTION(DTHETASM,+2,+4). SIN,COS(CDUY,Z,X) ARE IN
R0244 SINCDU,+2,+4 AND COSCDU,+2,+4 RESPECTIVELY,SCALED TO ONE HALF. CDU INCREENTS ARE PLACED IN DCDU,+2,+4 SCALED TO
R0246 ONE REVOLUTION.

R0247 * COS(IGA)SEC(MGA) 0 -SIN(IGA)SEC(MGA) *
R0248 * *
R0249 * -COS(IGA)TAN(MGA) 1 SIN(IGA)TAN(MGA) *
R0250 * *
R0251 * SIN(IGA) 0 COS(IGA) *

```
0252                          14,3412                BANK   14
0253  REF   1                 23,2000                SETLOC POWFLIT1
0254                          23,3675                BANK
0255                          23,3675   41345 C  SMCDURES DLOAD  DMP
0256  REF   7  LAST  582      23,3676   03212 0          DTHETASM
0257  REF   4  LAST  715      23,3677   00745 1          COSCDUY

0258                          23,3700   41325 C          PDDL   DMP
0259  REF   8  LAST 1336      23,3701   03216 1          DTHETASM +4
0260  REF   4  LAST  715      23,3702   00737 1          SINCDUY

0261                          23,3703   77621 1          BDSU
0262                          23,3704   77671 1          DDV
0263  REF   7  LAST  927      23,3705   00747 C          COSCDUZ
0264  REF   6  LAST  584      23,3706   03204 1          STORE  DCDU

0265                          23,3707   72405 C          DMP    SL1             SCALE
0266  REF   4  LAST  715      23,3710   00741 C          SINCDUZ
0267                          23,3711   77621 1          BDSU

0268  REF   9  LAST 1336      23,3712   03214 C          DTHETASM +2
0269  REF   7  LAST 1336      23,3713   17206 C          STODL  DCDU +2
0270  REF  10  LAST 1336      23,3714   03212 C          DTHETASM

0271                          23,3715   65205 C          DMP    PDDL
0272  REF   5  LAST 1336      23,3716   00737 1          SINCDUY
0273  REF  11  LAST 1336      23,3717   03216 1          DTHETASM +4

0274                          23,3720   43205 1          DMP    DAD
0275  REF   5  LAST 1336      23,3721   00745 1          COSCDUY
0276                          23,3722   77752 1          SL1
0277  REF   8  LAST 1336      23,3723   03210 1          STORE  DCDU +4
0278                          23,3724   77616 C          RVQ
```

L TIME OF FREE FALL USER'S PAGE NO. 1 EO S3

R0001 THE TFF SUBROUTINES MAY BE USED IN EITHER EARTH OR MOON CENTERED COORDINATES. THE TFF ROUTINES NEVER
R0003 KNOW WHICH ORIGIN APPLIES. IT IS THE USER WHO KNOWS, AND WHO SUPPLIES RONE, VONE AND 1/SQRT(MU) AT THE
R0005 APPROPRIATE SCALE LEVEL FOR THE PROPER PRIMARY BODY.

R0006	EARTH ORIGIN	POSITION	-29	METERS
R0007		VELOCITY	-7	METERS/CENTISECOND
R0009		1/SQRT(MU)	+17	SQRT(CS SQ/METERS CUBED)
R0011	MOON ORIGIN	POSITION	-27	METERS
R0012		VELOCITY	-5	METERS/CENTISECONDS
R0014		1/SQRT(MU)	+14	SQRT(CS SQ/METERS CUBED)

R0016 ALL DATA PROVIDED TO AND RECEIVED FROM ANY TFF SUBROUTINE WILL BE AT ONE OF THE LEVELS ABOVE. IN ALL CASES,
R0018 THE FREE FALL TIME IS RETURNED IN CENTISECONDS AT (-28). PROGRAM TFF/CONIC WILL GENERATE VONE/RTMU AND
R0020 LEAVE IT IN VONE' AT (+10) IF EARTH ORIGIN AND (+9) IF MOON ORIGIN.
R0021 THE USER MUST STORE THE STATE VECTOR IN RONE, VONE AND MU IN THE FORM 1/SQRT(MU) IN TFF/RTMU
R0023 AT THE PROPER SCALE BEFORE CALLING TFF/CONIC. SINCE RONE, VONE ARE IN THE EXTENDED VERB STORAGE AREA,
R0025 THE USER MUST ALSO LOCK OUT THE EXTENDED VERBS, AND RELEASE THEM WHEN FINISHED.
R0027 PROGRAMS CALC/TFF AND CALC/TPER ASSUME THAT THE TERMINAL RADIUS IS LESS THAN THE PRESENT
R0029 RADIUS. THIS RESTRICTION CAN BE REMOVED BY A 15 W CODING CHANGE, BUT AT PRESENT IT IS NOT DEEMED NECESSARY.
R0031
R0032 THE FOLLOWING ERASABLE QUANTITIES ARE USED BY THE TFF ROUTINES, AND ARE LOCATED IN THE PUSH LIST.
R0034

				BELOW	E:	IS USED FOR EARTH ORIGIN SCALE
A0036					M:	IS USED FOR MOON ORIGIN SCALE
A0037		TFFSW	=	119D BIT1	0 = CALCTFF	1 = CALCTPER
0038	0012	TFFDELQ	=	10D	Q2-Q1	E: (-16) M: (-15)
0039	0014	RMAG1	=	12D	ABVAL(RN) M	E: (-29) M: (-27)
A0040		RPER	=	14D	PERIGEE RADIUS M	E: (-29) M: (-27)
0041	0016	TFFQ1	=	14D	R.V / SQRT(MUE)	E: (-16) M: (-15)
A0042		SDELF/2			SIN(THETA) /2	
0043	0016	CDELF/2	=	14D	COS(THETA) /2	
A0044		RAPO	=	16D	APOGEE RADIUS M	E: (-29) M: (-27)
0045	0020	NRTERM	=	16D	TERMINAL RADIUS M	E: (-29+NR)
A0046						M: (-27+NR)
0047	0022	RTERM	=	18D	TERMINAL RADIUS M	E: (-29) M: (-27)
0048	0024	TFFVSQ	=	20D	-(V SQUARED/MU) 1/M	E: (20) M: (18)
0049	0026	TFF1/ALF	=	22D	SEMI MAJ AXIS M	E: (-22-2 NA)
A0050						M: (-20-2 NA)
0051	0030	TFFRTALF	=	24D	SQRT(ALFA)	E: (10+NA) M: (9+NA)
0052	0032	TFFALFA	=	26D	ALFA 1/M	E: (26-NR) M: (24-NR)
0053	0034	TFFNP	=	28D	SEMI LATUS RECTUM M	E: (-38+2 NR)
A0054						M: (-36+2 NR)
0055	0036	TFF/RTMU	=	30D	1/SQRT(MU)	E: (17) M: (14)
0056	0040	NRMAG	=	32D	PRESENT RADIUS M	E: (-29+NR)
A0057						M: (-27+NR)
0058	0042	TFFX	=	34D		
0059	0044	TFFTEM	=	36D	TEMPORARY	

```
A0060                   REGISTERS S1, S2 ARE UNTOUCHED BY ANY TFF SUBROUTINE
A0061                   INDEX REGISTERS X1, X2 ARE USED BY ALL TFF SUBROUTINES. THEY ARE ESTAB-
A0062                   LISHED IN TFF/CONIC AND MUST BE PRESERVED BETWEEN CALLS TO SUBSEQUENT
A0063                   SUBROUTINES.
A0064                   -NR                     C(X1) = NORM COUNT OF RMAG
A0065                   -NA                     C(X2)= NORM COUNT OF SQRT(ABS(ALFA))
```

```
R0066

R0067  SUBROUTINE NAME:     TFFCONIC                                        DATE:    01.29.67
R0069  MOD NO:  0                                                           LOG SECTION:    TIME OF FREE FALL
R0071  MOD BY:  RR BAIRNSFATHER
R0072  MOD NO:  1            MOD BY:  RR BAIRNSFATHER      DATE:  11 APR 67
R0073  MOD NO:  2            MOD BY:  RR BAIRNSFATHER      DATE:  21 NOV 67     ADD MOON MU.
R0075  MOD NO:  3            MOD BY:  RR BAIRNSFATHER      DATE:  21 MAR 68     ACCEPT DIFFERENT EARTH/MOON SCALES
R0077  FUNCTIONAL DESCRIPTION:      THIS SUBROUTINE IS CALLED TO COMPUTE THOSE CONIC PARAMETERS REQUIRED BY THE TFF
R0079          SUBROUTINES AND TO ESTABLISH THEM IN THE PUSH LIST AREA. THE PARAMETERS ARE LISTED UNDER OUTPUT.
R0081          THE EQUATIONS ARE
R0082                  - - -
R0083                H = RN*VN                                              ANGULAR MOMENTUM
R0085                    - -
R0086                LCP = H.H / MU                                         SEMI LATUS RECTUM
R0088                          - -
R0089                ALFA = 2/RN - VN.VN / MU                               RECIPROCAL SEMI MAJ AXIS, SIGNED

R0091          AND ALFA IS POS FOR ELLIPTIC  ORBITS
R0092                      0  FOR PARABOLIC ORBITS
R0093                    NEG FOR HYPERBOLIC ORBITS.
R0094          SUBROUTINE ALSO COMPUTES AND SAVES  RMAG.
R0095  CALLING SEQUENCE:
R0096          TFFCONIC  EXPECTS CALLER TO ENTER WITH CORRECT GRAVITATIONAL CONSTANT IN MPAC, IN THE FORM
R0098          1/SQRT(MU). PROGRAM WILL SAVE IN  TFF/RTMU  . THE SCALE IS DETERMINED BY WHETHER EARTH OR MOON
R0100          ORIGIN IS USED.  THE CALLER MUST LOCK OUT THE EXTENDED VERBS BEFORE PROVIDING STATE VECTOR IN RONE,
R0102          VONE  AT PROPER SCALE. THE EXTENDED VERBS MUST BE RESTORED WHEN THE CALLER IS FINISHED USING THE
R0104          TFF ROUTINES.
R0105          ENTRY POINT  TFFCONMU  EXPECTS THAT  TFF/RTMU  IS ALREADY LOADED.
R0107          TO SPECIFY MU:      CLOAD  CALL                    IF MU ALREADY STORED:    CALL
R0109                                     YCLRMU      1/RTMU  E: (17)  M: (14)                TFFCONMU
R0111                                     TFFCONIC
R0112          PUSHLOC = PDL+0, ARBITRARY IF LEQ 180

R0113  SUBROUTINES CALLED:  NONE
R0114  NORMAL EXIT MODES:   FVQ
R0115  ALARMS:  NONE
R0116  OUTPUT:  THE FOLLOWING ARE STORED IN THE PUSH LIST AREA.
R0117          RMAG1  E:(-29) M:(-27) M  RN, PRESENT RADIUS LENGTH.
R0118          NRMAG  E: (-29+NR)     M  RMAG, NORMALIZED
R0119                 M: (-27+NR)
R0120          X1                          -NR, NORM COUNT
R0121          TFFNP  E: (-38+2NR)    M  LCP, SEMI LATUS RECTUM, WEIGHTED BY NR.      FOR VGAMCALC
R0123                 M: (-36+2NR)
R0124          TFF/RTMU  E:(17)  M:(14)       1/SQRT(MU)
R0125          TFFVSQ E:(20)  M:(18)  1/M   -(V SQ/MU): PRESENT VELOCITY,NORMLIZED.   FOR VGAMCALC
R0127          TFFALFA  E: (26-NR)    1/M   ALFA, WEIGHTED BY NR
R0128                   M: (24-NR)
R0129          TFFRTALF  E: (10+NA)   SQRT(ALFA), NORMALIZED
R0130                    M: (9+NA)
```

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R0131            X2                          -NA, NORM COUNT
R0132            TFF1/ALF  E: (-22-2NA) SIGNED SEMI MAJ AXIS, WEIGHTED BY NA
R0133                      M: (-20-2NA)
R0134            PUSHLOC AT PDL+0
R0135            THE FOLLOWING  IS STORED IN GENERAL ERASABLE
R0136            VONE'  E:(10)  M:(9)   V/RT(MU), NORMALIZED VELOCITY
R0137  ERASABLE INITIALIZATION REQUIRED:
R0138            RONE   E:(-29)  M:(-27)  M      STATE VECTOR          LEFT BY CALLER
R0140            VONE   E:(-7)   M:(-5)   M/CS   STATE VECTOR          LEFT BY CALLER
R0142            TFF/RTMU  E:(17)  M:(14)      1/RT(CS SQ/M CUBE)    IF ENTER VIA  TFFCONMU.
R0144  DEBRIS:   QPRET,    PDL+0 ... PDL+3
R0145

 0146                          33,3773                    BANK   33
 0147  REF   1                 27,2000                    SETLOC TOF-FF
 0148                          27,2721                    BANK

 0149  REF   1                                            COUNT* $$/TFF

 0150  REF   5  LAST  765      27,2721   00037 0  TFFCONIC STORE  TFF/RTMU      1/SQRT(MU)      E: (17)   M: (14)

 0151                          27,2722   53575 0  TFFCONMU VLOAD  UNIT          COME HERE WITH TFFRTMU LOADED.
 0152  REF  16  LAST  741      27,2723   02327 0                  RONE          SAVED RN.  M     E: (-29)  M: (-27)
 0153                          27,2724   77725 1  PDDL                         UR/2 TO PDL+0, +5
 0154                          27,2725   00045 0                  36D           MAGNITUDE
 0155  REF   1                 27,2726   00015 0  STORE   RMAG1                M    E: (-29)   M: (-27)

 0156                          27,2727   77701 1  NORM
 0157  REF  88  LAST 1306      27,2730   00047 1                  X1            -NR
 0158  REF   4  LAST  766      27,2731   24041 1  STOVL   NRMAG                RMAG  M   E: (-29+NR)  M: (-27+NR)
 0159  REF  11  LAST  741      27,2732   02335 0                  VONE          SAVED VN.  M/CS   E: (-7)   M: (-5)
 0160                          27,2733   77761 1  VXSC
 0161  REF   6  LAST 1340      27,2734   00037 0                  TFF/RTMU      E: (17)   M: (14)
 0162  REF   2  LAST   89      27,2735   02372 0  STORE   VONE'                VN/SQRT(MU)   E: (10)   M: (9)

 0163                          27,2736   47361 0  VXSC    VXV
 0164  REF   5  LAST 1340      27,2737   00041 1                  NRMAG         E: (-29+NR)  M: (-27+NR)
A0165                                                             UR/2 FROM PDL
 0166                          27,2740   47572 1  VSL1    VSQ                   BEFORE:  E:(-19+NR)  M:(-18+NR)
 0167  REF   2  LAST  765      27,2741   14035 1  STODL   TFFNP                 LC P  M   E:(-38+2NR)  M:(-36+2NR)
A0168                                                             SAVE ALSO FOR VGAMCALC
 0169  REF   1                 27,2742   15322 0                  TFF1/4
 0170                          27,2743   63271 0  DDV     PDVL                  (2/RMAG)  1/M   E:(26-NR)   M:(24-NR)
 0171  REF   6  LAST 1340      27,2744   00041 1                  NRMAG         RMAG  M   E:(-29+NR)  M:(-27+NR)
 0172  REF   3  LAST 1340      27,2745   02372 0                  VONE'         SAVED VN.   E: (10)   M: (9)
 0173                          27,2746   57436 1  VSQ     DCOMP                 KEEP MPAC+2 HONEST FOR SQRT.
 0174  REF   2  LAST  765      27,2747   00025 0  STORE   TFFVSQ                -(V SQ/MU)   E:(20)   M:(18)
A0175                                                             SAVE FOR VGAMCALC
 0176                          27,2750   43257 0  SR*     DAD
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0177                          27,2751  20573 1                 0 -6,1          GET -VSQ/MU   E:(26-NR)   M:(24-NR)
0178                          27,2752  77626 C          STADR
A0179                                                                          2/RMAG   FROM PDL+2
0180  REF   1                 27,2753  77744 C          STORE  TFFALFA        ALFA  1/M   E:(26-NR)   M:(24-NR)
0181                          27,2754  41457 1          SL*    PUSH           TEMP SAVE ALFA    E:(20)   M:(18)
0182                          27,2755  20173 C                 0 -6,1
0183                          27,2756  75446 C          ABS    SQRT           E:(10)   M:(9)
0184                          27,2757  77701 1          NORM
0185  REF  39  LAST 1332      27,2760  00050 1                 X2             X2 = -NA
0186  REF   1                 27,2761  00031 0          STORE  TFFRTALF       SQRT( ABS(ALFA) )  E:(10+NA)   M:(9+NA)
0187                          27,2762  75316 1          DSQ    SIGN           NOT SO ACCURATE, BUT OK
A0188                                                                         ALFA FROM PDL+2   E:(20)   M:(18)
0189                          27,2763  55254 1          BZE    BDDV           SET 1/ALFA =0, TO SHOW SMALL ALFA
0190                          27,2764  56766 C                 +2
0191  REF   2  LAST 1340      27,2765  15322 C                 TFF1/4
0192  REF   1                 27,2766  00027 1  +2     STORE  TFF1/ALF       1/ALFA   E:(-22-2 NA)   M:(-20-2 NA)
0193                          27,2767  77616 C  DUMPCNIC RVQ

A0194                                                                                                   39 W
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```
R0195   SUBROUTINE NAME:      TFFRP/RA                                        DATE:  01.17.67
R0197   MOD NO:  0                                                           LOG SECTION:    TIME OF FREE FALL
R0199   MOD BY:  RR BAIRNSFATHER
R0200   MOD NO:  1             MOD BY:  RR BAIRNSFATHER      DATE:  11 APR 67
R0201   MOD NO:  2             MOD BY:  RR BAIRNSFATHER      DATE:  21 MAR 68    ACCEPT DIFFERENT EARTH/MOON SCALES
R0203                                                                       ALSO IMPROVE ACCURACY OF RAPO.
R0205   FUNCTIONAL DESCRIPTION:          USED BY CALCTPER AND TFF DISPLAYS TO CALCULATE PERIGEE RADIUS AND ALSO
R0207           APOGEE RADIUS FOR A GENERAL CONIC.
R0208           PROGRAM GIVES PERIGEE RADIUS AS                 APOGEE RADIUS IS GIVEN BY
R0210                   RP = P /(1+E)                                   RA = (1+E) / ALFA
R0212           WHERE   2
R0213                   E  = 1 - P ALFA
R0214           IF RA IS NEGATIVE OR SHOWS DIVIDE OVERFLOW, THEN RA = POSMAX BECAUSE
R0216                   1. APOGEE RADIUS IS NOT MEANINGFUL FOR HYPERBOLA
R0217                   2. APOGEE RADIUS IS NOT DEFINED FOR PARABOLA
R0218                   3. APOGEE RADIUS EXCEEDS THE SCALING FOR ELLIPSE.
R0219           THIS SUBROUTINE REQUIRES THE SIGNED  RECIPROCAL SEMI MAJ AXIS,  ALFA,  AND SEMI LATUS RECTUM AS DATA.
R0221   CALLING SEQUENCE:  CALL
R0222                           TFFRP/RA
R0223           PUSHLOC = PDL+0, ARBITRARY IF LEQ 100
R0224           C(MPAC) UNSPECIFIED

R0225   SUBROUTINES CALLED:  NONE
R0226   NORMAL EXIT MODE:    RVQ
R0227           IF ELLIPSE, WITHIN NORMAL SCALING, RAPO IS CORRECT.
R0228           OTHERWISE, RAPO = POSMAX.
R0229   ALARMS:  NONE
R0230   OUTPUT:  STORED IN PUSH LIST AREA. SCALE OF OUTPUT AGREES WITH DATA SUPPLIED TO  TFF/CONIC.
R0232           RPER   E:(-29)  M:(-27)  M     PERIGEE RADIUS              DESTROYED BY CALCTFF/CALCTPER, TFFTRIG.
R0234           RAPO   E:(-29)  M:(-27)  M     APOGEE  RADIUS              WILL BE DESTROYED BY CALCTFF/CALCTPER
R0236           PUSHLOC AT PDL+0
R0237   ERASABLE INITIALIZATION REQUIRED:
R0238           TFFALFA E:(26-NR)      M   1/SEMI MAJ AXIS                 LEFT BY TFFCONIC
R0240                   M:(24-NR)
R0241           TFFNP  E: (-38+2NR)    M  LC P, SEMI LATUS RECTUM          LEFT BY TFFCONIC
R0243                  M: (-36+2NR)
R0244           X1                     -NR, NORM COUNT OF RMAG             LEFT BY TFFCONIC
R0246           X2                     -NA, NORM COUNT OF ALFA             LEFT BY TFFCONIC
R0248   DEBRIS:  QPRET,    PDL+0 ... PDL+1
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PC249
 0250                          0020          RAPO     =      16D          APOGEE RADIUS  M  E:(-29)  M:(-27)
 0251                          0016          RPER     =      14D          PERIGEE RADIUS  M  E:(-29)  M:(-27)
A0252
 0253                    27,2770  41345 C  TFFRP/RA DLOAD    DMP
 0254  REF  2 LAST 1341  27,2771  00033 1                    TFFALFA      ALFA  1/M  E:(26-NR)   M:(24-NR)
 0255  REF  3 LAST 1340  27,2772  00035 1                    TFFNP        LC P  M   E:(-38+2NR)   M:(-36+2NR)
 0256                    27,2773  57457 C          SR*      DCOMP        ALFA P (-12+NR)
 0257                    27,2774  20571 C                   0 -8D,1      ALFA P  (-4)
 0258                    27,2775  51415 C          DAD      ABS          (DCOMP GIVES VALID TP RESULT FOR SQRT)
A0259                                                                    (ABS PROTECTS SQRT IF E IS VERY NEAR 0)
 0260  REF  3 LAST  83C  27,2776  17330 1                    DP2(-4)
 0261                    27,2777  43366 C          SQRT     DAD          E SQ = (1- P ALFA)   (-4)
 0262  REF  3 LAST 1341  27,3000  15322 C                   TFF1/4
 0263                    27,3001  55206 C          PUSH     BDDV         (1+E)  (-2)  TO PDL+0
 0264  REF  4 LAST 1343  27,3002  00035 1                    TFFNP        LCP  M E:(-38+2NR)   M:(-36+2NR)
 0265                    27,3003  53657 C          SR*      SR*          (DOES SR THEN SL TO AVOID OVFL)
 0266                    27,3004  20601 1                   0,1          X1=-NR
 0267                    27,3005  20572 C                   0 -7,1       (EFFECTIVE SL)
 0268  REF  3 LAST  512  27,3006  14017 1          STODL    RPER         PERIGEE RADIUS  M   E:(-29)   M:(-27)
A0269                                                                    (1+E)  (-2)   FROM PDL+0
 0270                    27,3007  41005 1          DMP      BOV8
 0271  REF  2 LAST 1341  27,3010  00027 1                    TFF1/ALF     E:(-22-2NA)  M:(-20-2NA)
 0272  REF 10 LAST 1299  27,3011  57314 0                    TCDANZIG     CLEAR OVFIND, IF ON.
 0273                    27,3012  53654 C          BZE      SL*
 0274  REF  1            27,3013  57022 0                    MAXRA        SET POSMAX, IF ALFA=0
 0275                    27,3014  57603 0                    0 -5,2       -5+NA
 0276                    27,3015  40057 1          SL*      BOV
 0277                    27,3016  57576 1                   0,2
 0278  REF  2 LAST 1343  27,3017  57022 0                    MAXRA        SET POSMAX IF OVFL.
 0279                    27,3020  77644 1          BPL                   CONTINUE WITH VALID RAPO.
 0280                    27,3021  57024 0                   +3
 0281                    27,3022  77745 1  MAXRA    DLOAD                RAPO CALC IS NOT VALID. SET RAPO =
 0282  REF  4 LAST  83C  27,3023  17334 C                   NEARONE      POSMAX AS A TAG.
 0283  REF  1            27,3024  00021 1  +3       STORE    RAPO         APOGEE RADIUS  M   E:(-29)   M:(-27)
 0284                    27,3025  77616 C  DUMPRPRA RVQ
A0285                                                                                          30 W
```

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R0286   SUBROUTINE NAME:     CALCTPER  /  CALCTFF                          DATE:    01.29.67
R0288   MOD NO:  0                                                         LOG SECTION:    TIME OF FREE FALL
R0290   MOD BY:  RR BAIRNSFATHER
R0291   MOD NO:  1           MOD BY:  RR BAIRNSFATHER      DATE:  21 MAR 67
R0292   MOD NO:  2           MOD BY:  RR BAIRNSFATHER      DATE:  14 APR 67
R0293   MOD NO:  3           MOD BY:  RR BAIRNSFATHER      DATE:  8JUL 67      NEAR EARTH MUE AND NEG TFF (GONEPAST)
R0295   MOD NO:  4           MOD BY:  RR BAIRNSFATHER      DATE:  21 NOV 67    ADD VARIABLE MU.
R0297   MOD NO:  5           MOD BY:  RR BAIRNSFATHER      DATE:  21 MAR 68    ACCEPT DIFFERENT EARTH/MOON SCALES
R0299   FUNCTIONAL DESCRIPTION:      PROGRAM CALCULATES THE FREE-FALL TIME OF FLIGHT FROM PRESENT POSITION  RN  AND
R0301           VELOCITY  VN  TO A RADIUS LENGTH SPECIFIED BY  RTERM  , SUPPLIED BY THE USER. THE POSITION VECTOR
R0303           RN  MAY BE ON EITHER SIDE OF THE CONIC, BUT  RTERM  IS CONSIDERED ON THE INBOUND SIDE.
R0305           THE EQUATIONS ARE

R0306                   Q2 = -SQRT(RTERM (2-RTERM ALFA) - LCP)    (INBOUND SIDE))        LEQ +- LCE/SQRT(ALFA)
R0308                     - -
R0309                   Q1 = RN.VN / SQRT(MU)                                          LEQ +- LCE/SQRT(ALFA)

R0311                   Z = NUM / DEN                                                  LEQ +- 1/SQRT(ALFA)

R0313           WHERE, IF INBOUND
R0314                   NUM = RTERM - RN                                               LEQ +- 2 LCE/ALFA
R0316                   DEN = Q2+Q1                                                    LEQ +- 2 LCE/SQRT(ALFA)

R0318           AND, IF OUTBOUND
R0319                   NUM = Q2-Q1                                                    LEQ +- 2 LCE/SQRT(ALFA)
R0321                   DEN = 2 - ALFA (RTERM + RN) .                                  LEQ +- 2 LCE

R0323           IF      ALFA ZZ  <  1.0                 (FOR ALL CONICS EXCEPT ELLIPSES HAVING ABS(DEL ECC ANOM) G 90 DEG)

R0325           THEN    X = ALFA Z Z
R0326           AND     TFF = (RTERM +RN -2 ZZ T(X) ) Z/SQRT(MU)

R0327                   EXCEPT IF ALFA PNZ, AND IF TFF NEG,
R0328                   THEN   TFF = 2 PI /(ALFA SQRT(ALFA)) + TFF

R0329           OR IF   ALFA ZZ  GEQ  1.0               (FOR ELLIPSES HAVING ABS(DEL ECC ANOM) GEQ 90 DEG)

R0331           THEN    X = 1/ALFA Z Z
R0332           AND     TFF = (PI/SQRT(ALFA) -Q2 +Q1 +2(X T(X) -1) /ALFA Z) /ALFA SQRT(MU)

R0334           WHERE   T(X) IS A POLYNOMIAL APPROXIMATION TO THE SERIES
R0335                             2     3                          2
R0336                   1/3 -X/5 +X /7 -X /9 ...                (X   <  1.0)

R0337   CALLING SEQUENCE:  TIME TO RTERM                          TIME TO PERIGEE
R0339                        CALL                                 CALL
R0340                              CALCTFF                              CALCTPER
R0342                      C(MPAC) = TERMNL RAD  M                C(MPAC) = PERIGEE RAD  M
R0344           FOR EITHER,   E: (-29)    M: (-27)
R0345           FOR EITHER, PUSHLOC = PDL+0 , ARBITRARY IF LEQ 8D.
```

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R0346   SUBROUTINES CALLED:  T(X),  VIA RTB
R0347   NORMAL EXIT MODE:  RVQ
R0348           HOWEVER, PROGRAM EXITS WITH ONE OF THE FOLLOWING VALUES FOR TFF (-28) CS  IN MPAC. USER MUST STORE.
R0350                A.  TFF= FLIGHT TIME. NORMAL CASE FOR POSITIVE FLIGHT TIME LESS THAN ONE ORBITAL PERIOD.
R0352                B.  (THIS OPTION IS NO LONGER USED.)
R0353                C.  TFF = POSMAX.  THIS INDICATES THAT THE CONIC FROM THE PRESENT POSITION WILL NOT RETURN TO
R0355                    THE SPECIFIED ALTITUDE.  ALSO INDICATES OUTBOUND PARABOLA OR HYPERBOLA.
R0357   OUTPUT:  C(MPAC)  (-28)  CS      TIME OF FLIGHT, OR TIME TO PERIGEE
R0358           TFFX     (0)            X,                          LEFT FOR ENTRY DISPLAY TFF ROUTINES
R0360           NRTERM   E: (-29+NR)    M  RTERM, WEIGHTED BY NR    LEFT FOR ENTRY DISPLAY TFF ROUTINES
R0362                    M: (-27+NR)
R0363           TFFTEM   E: (-59+2NR)   LCP 2 2 SGN(SDELF)          LEFT FOR ENTRY DISPLAY TFF ROUTINES
R0365                    M: (-55+2NR)   LCP /ALFA SGN(SDELF)        LEFT FOR ENTRY DISPLAY TFF ROUTINES
R0367           NOTE:  TFFTEM = PDL 36D AND WILL BE DESTROYED BY .:UNIT:.
R0368           RMAG1  E:(-29)  M:(-27)  PDL 12 NOT TOUCHED.
R0369           TFFQ1  E:(-16)  M:(-15)  PDL 14D
R0370           TFFDELQ E:(-16) M:(-15)  PDL 10D
R0371           PUSHLOC AT PDL+0
R0372   ERASABLE INITIALIZATION REQUIRED:
R0373           RONE   E:(-29)  M:(-27)  M   STATE VECTOR            LEFT BY USER
R0375           VONE*  E:(+10)  M:(+9)   VN/SQRT(MU)                LEFT BY TFF/CONIC
R0377           RMAG1  E:(-29)  M:(-27)  PRESENT RADIUS,  M         LEFT BY TFFCONIC
R0379           C(MPAC)E:(-29)  M:(-27)  RTERM, TERMINAL RADIUS LENGTH, M   LEFT BY USER
R0381           THE FOLLOWING ARE STORED IN THE PUSH LIST AREA.
R0382           TFF/RTMU  E:(17)  M:(14)  1/SQRT(MU)                LEFT BY TFFCONIC.
R0384           NRMAG  E: (-29+NR)  M  RMAG, NORMALIZED             LEFT BY TFFCONIC
R0386                  M: (-27+NR)
R0387           X1                      -NR, NORM COUNT             LEFT BY TFFCONIC
R0389           TFFNP  E: (-38+2NR)  M   LCP, SEMI LATUS RECTUM, WEIGHT  NR   LEFT BY TFFCONIC
R0391                  M: (-36+2NR)
R0392           TFFALFA  E: (26-NR)   1/M  ALFA, WEIGHT  NR         LEFT BY TFFCONIC
R0394                    M: (24-NR)
R0395           TFFRTALF  E:(10+NA)    SQRT(ALFA), NORMALIZED       LEFT BY TFFCONIC
R0397                     M:(9+NA)
R0398           X2                      -NA, NORM COUNT             LEFT BY TFFCONIC
R0400           TFF1/ALF  E: (-22-2NA)  SIGNED SEMIMAJ AXIS, WEIGHTED BY NA   LEFT BY TFFCONIC
R0402                     M: (-20-2NA)
R0403   DEBRIS:  QPRET,   PDL+0 ... PDL+3
R0404           RTERM  E:(-29)  M:(-27)  RTERM, TERMINAL RADIUS LENGTH
R0405           RAPO   E:(-29)  M:(-27)  PDL 16D  (=NRTERM)
R0406           RPER   E:(-29)  M:(-27)  PDL 14D   (=TFFQ1)
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P0407
 0408                          27,3026  77614 1  CALCTPER SETGO                 ENTER WITH RPER  IN MPAC
 0409  REF   1                 27,3027  03436 C                  TFFSW
 0410                          27,3030  57033 C                  +3
 0411                          27,3031  77614 1  CALCTFF  CLEAR                 ENTER WITH RTERM IN MPAC
 0412  REF   2  LAST 1346     27,3032  03676 C                  TFFSW
 0413  REF   3  LAST  761     27,3033  00023 C  +3      STORE   RTERM           E: (-29)  M: (-27)
 0414                          27,3034  77657 C          SL*
 0415                          27,3035  20201 0                  0,1            X1=-NR
 0416  REF   6  LAST  766     27,3036  00021 1          STORE   NRTERM          RTERM  E: (-29+NR)  M: (-27+NR)
 0417                          27,3037  44205 C          DMP     BDSU
 0418  REF   3  LAST 1343     27,3040  00033 1                  TFFALFA         ALFA  E: (26-NR)  M: (24-NR)
 0419  REF   4  LAST 1343     27,3041  15322 C                  TFF1/4
 0420                          27,3042  41206 C          PUSH    DMP             (2-ALFA RTERM)  (-3)  TO PDL+0
 0421  REF   7  LAST 1346     27,3043  00021 1                  NRTERM          E: (-29+NR)  M: (-27+NR)
 0422                          27,3044  53725 1          PDDL    SR*             RTERM(2-ALFA RTERM) TO PDL+2
A0423                                                                           E: (-32+NR)   M: (-30+NR)
 0424  REF   5  LAST 1343     27,3045  00035 1                  TFFNP           LC P  E:(-38+2NR)  M:(-36+2NR)
 0425                          27,3046  20573 1                  0 -6,1         X1 = -NR
 0426                          27,3047  43276 C          DCOMP   DAD             DUE TO SHIFTS, KEEP PRECISION FOR SQRT
A0427                                                                           RTERM(2-ALFA RTERM) FROM PDL+2
A0428                                                                           E: (-32+NR)  M: (-30+NR)
 0429                          27,3050  77657 C          SR*                    LEAVE  E: (-32)  M: (-30)
 0430                          27,3051  20601 1                  0,1            X1 = -NR
 0431                          27,3052  71214 C          BOFF    DLOAD           CHECK TFF / TPER SWITCH
 0432  REF   3  LAST 1346     27,3053  03756 C                  TFFSW
 0433                          27,3054  57056 C                  +2             IF TFF, CONTINUE
 0434  REF   1                 27,3055  15332 1                  TFFZEROS       IF TPER, SET Q2 = 0
 0435                          27,3056  75440 C  +2      BMN     SQRT            E: (-16)  M: (-15)

 0436  REF   1                 27,3057  57211 1                  MAXTFF1        NO FREE FALL CONIC TO RTERM FROM HERE
A0437                                                                           RESET PDL, SET TFF=POSMAX, AND EXIT.

 0438                          27,3060  41076 C          DCOMP   BOVB            RT IS ON INBOUND SIDE.  ASSURE OVFIND=0
 0439  REF  11  LAST 1343     27,3061  57314 C                  TCDANZIG        ANY PORT IN A STORM.
 0440  REF   3  LAST  767     27,3062  24045 C          STOVL   TFFTEM          Q2   E: (-16)  M: (-15)
 0441  REF   4  LAST 1340     27,3063  02372 C                  VONE'           VN/SQRT(MU) E: (10)  M: (9)
 0442                          27,3064  52441 1          DOT     SL3
 0443  REF  17  LAST 1340     27,3065  02327 C                  RONE            SAVED RN.  E: (-29)  M: (-27)
 0444  REF   1                 27,3066  00017 1          STORE   TFFQ1           Q1, SAVE FOR GONEPAST TEST.
A0445                                                                           E: (-16)  M: (-15)
 0446                          27,3067  44240 1          BMN     BDSU
 0447  REF   1                 27,3070  57111 1                  INBOUND        USE ALTERNATE Z
 0448  REF   4  LAST 1346     27,3071  00045 C                  TFFTEM          Q2  E: (-16)  M: (-15)

A0449                                        OUTBOUND  Z CALC CONTINUES HERE

 0450  REF   2  LAST  766     27,3072  14043 C          STODL   TFFX            NUM=Q2-Q1  E: (-16)  M: (-15)
 0451  REF   4  LAST 1346     27,3073  00033 1                  TFFALFA         ALFA  E: (26-NR)  M: (24-NR)
 0452                          27,3074  44205 C          DMP     BDSU
```

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```
 0453  REF  7  LAST 1340   27,3075  00041 1                NRMAG     RMAG  E: (-29+NR)  M: (-27+NR)
A0454                                                                (2-RTERM ALFA)  (-3) FROM PDL+0
 0455                      27,3076  51406 1  SAVEDEN  PUSH  ABS       DEN TO PDL+0  E: (-3) OR (-16)
A0456                                                                          M: (-3) OR (-15)
 0457                      27,3077  40015 1           DAD   BOV       INDETERMINANCY TEST
 0458  REF  1              27,3100  17322 1                 LIM(-22)  =1.0-B(-22)
 0459  REF  1              27,3101  57122 1                 TFFXTEST  GO IF DEN >/= B(-22)
 0460                      27,3102  65345 0           DLOAD PDDL      SET DEN=0  OTHERWISE
 0461  REF  2  LAST 1346   27,3103  15332 1                 TFFZEROS
A0462                                                                XCH ZERO WITH PDL+0
 0463                      27,3104  57545 1           DLOAD DCOMP
 0464  REF  5  LAST 1346   27,3105  00033 1                 TFFALFA   ALFA  E: (26-NR)  M: (24-NR)
 0465                      27,3106  71240 1           BMN   DLOAD     FOR TPER: Z INDET AT DELE/2=0 AND 90.
 0466  REF  1              27,3107  57216 0                 TFFEL1    ASSUME 90, AND LEAVE 0 IN PDL: 1/Z=D/N

A0467                                                                Z INDET. AT PERIGEE FOR PARAB OR HYPERB.
 0468                      27,3110  77616 0  DUMPTFF1 RVQ             RETURN  TFF =0

A0469                                       INBOUND  Z  CALC CONTINUES HERE
 0470                      27,3111  77745 1  INBOUND  DLOAD           RESET PDL+0
 0471                      27,3112  45345 1           DLOAD DSU       ALTERNATE Z CALC
 0472  REF  4  LAST 1346   27,3113  00023 0                 RTERM     E: (-29)  M: (-27)
 0473  REF  2  LAST 1340   27,3114  00015 0                 RMAG1     E: (-29)  M: (-27)
 0474  REF  3  LAST 1346   27,3115  14043 0           STODL TFFX      NUM=RTERM-RN  E: (-29)  M: (-27)
 0475  REF  5  LAST 1346   27,3116  00045 0                 TFFTEM    Q2  E: (-16)  M: (-15)
 0476                      27,3117  52015 1           DAD   GOTO
 0477  REF  2  LAST 1346   27,3120  00017 1                 TFFQ1     Q1  E: (-16)  M: (-15)
 0478  REF  1              27,3121  57076 1                 SAVEDEN   DEN = Q2+Q1  E: (-16)  M: (-15)

 0479                      27,3122  65215 1  TFFXTEST DAD   PDDL       (ABS(DEN) TO PDL+2))  E: (-3) OR (-16)
A0480                                                                          M: (-3) OR (-15)
 0481  REF  1              27,3123  17324 1                 DP(-22)   RESTORE ABS(DEN) TO MPAC
 0482  REF  4  LAST 1347   27,3124  00043 0                 TFFX      NUM E:(-16) OR (-29)  M:(-15) OR (-27)
 0483                      27,3125  53605 1           DMP   SR*
 0484  REF  2  LAST 1341   27,3126  00031 0                 TFFRTALF  SQRT(ALFA)  E: (10+NA)  M: (9+NA)
 0485                      27,3127  57201 0                 0 -3,2    X2=-NA
 0486                      27,3130  77671 1           DDV             C(MPAC) =NUM SQRT(ALFA)  E:(-3) OR (-16)
A0487                                                                          M:(-3) OR (-15)
A0488                                                                ABS(DEN) FROM PDL+2  E:(-3) OR (-16)
A0489                                                                          M:(-3) OR (-15)
 0490                      27,3131  40145 0           DLOAD BOV       (THE DLOAD IS SHARED WITH TFFELL)
 0491  REF  5  LAST 1347   27,3132  00043 0                 TFFX      NUM  E: (-16) OR (-29)  M:(-15) OR (-27)
 0492  REF  1              27,3133  57214 1                 TFFELL    USE EQN FOR DELE GEQ 90, LEQ -90

A0493                                       OTHERWISE, CONTINUE FOR GENERAL CONIC FOR TFF EQN

 0494                      27,3134  45471 1           DDV   STADR
A0495                                                                DEN FROM PDL+0   E: (-3) OR (-16)
A0496                                                                             M: (-3) OR (-15)
 0497  REF  6  LAST 1347   27,3135  77732 1           STORE TFFTEM    Z  SAVE FOR SIGN OF SDELF.
```

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```
A0498                                                          E: (-13)  M: (-12)
 0499                    27,3136  63406 C        PUSH  DSQ     Z TO PDL+0
 0500                    27,3137  41206 C        PUSH  DMP     Z SQ TO PDL+2  E: (-26)  M: (-24)
 0501  REF  6 LAST 1346 27,3140  00035 1              TFFNP     LC P  E: (-38+2NR)  M: (-36+2NR)
 0502                    27,3141  75261 C        SL    SIGN
 0503                    27,3142  20206 1              5
 0504  REF  7 LAST 1347 27,3143  00045 C              TFFTEM    AFFIX SIGN FOR SDELF (ENTRY DISPLAY)
 0505  REF  8 LAST 1348 27,3144  14045 C        STODL TFFTEM    P ZSQ  E: (-59+2NR)  M: (-55+2NR)
A0506                                                          (ARG IS USED IN TFF/TRIG)
A0507                                                          ZSQ FROM PDL+2  E: (-26)  M: (-24)
 0508                    27,3145  41206 C        PUSH  DMP     RESTORE PUSH LOC
 0509  REF  6 LAST 1347 27,3146  00033 1              TFFALFA   ALFA  E: (26-NR)  M: (24-NR)
 0510                    27,3147  77657 C        SL*
 0511                    27,3150  20201 0              0,1       X1=-NR
 0512  REF  6 LAST 1347 27,3151  00043 C        STORE TFFX      X
 0513                    27,3152  41234 1        RTB   DMP
 0514  REF  1           27,3153  57276 C              T(X)      POLY
A0515                                                          ZSQ FROM PDL+2  E: (-26)  M: (-24)
 0516                    27,3154  44302 C        SR2   BDSU    2 ZSQ T(X)  E: (-29)  M: (-27)
 0517  REF  5 LAST 1347 27,3155  00023 C              RTERM     RTERM  E: (-29)  M: (-27)
 0518                    27,3156  41215 1        DAD   DMP
 0519  REF  3 LAST 1347 27,3157  00015 C              RMAG1     E: (-29)  M: (-27)
A0520                                                          Z FROM PDL+0  E: (-13)  M: (-12)
 0521                    27,3160  51042 C        SR3   BPL     TFF SQRT(MU)  E: (-45)  M: (-42)
 0522  REF  1           27,3161  57202 C              ENDTFF    (NO PUSH UP)
 0523                    27,3162  75206 1        PUSH  SIGN    TFF SQRT(MU)  TO PDL+0
 0524  REF  3 LAST 1347 27,3163  00017 1              TFFQ1     Q1 FOR GONEPAST TEST
 0525                    27,3164  71244 C        BPL   DLOAD   GONE PAST ?
 0526  REF  1           27,3165  57206 1              NEGTFF    YES. TFF < 0 .
 0527  REF  3 LAST 1343 27,3166  00027 1              TFF1/ALF  1/ALFA  E: (-22-2NA)  M: (-20-2NA)
 0528                    27,3167  51076 1        DCOMP BPL     ALFA > 0 ?
 0529  REF  2 LAST 1348 27,3170  57206 1              NEGTFF    NO. TFF IS NEGATIVE.

A0530                                  CORRECT FOR ORBITAL PERIOD.

 0531                    27,3171  77676 C        DCOMP         YES. CORRECT FOR ORB PERIOD.
 0532                    27,3172  56205 C        DMP   DDV
 0533  REF  1           27,3173  17320 0              PI/16     2 PI (-5)
 0534  REF  3 LAST 1347 27,3174  00031 C              TFFRTALF  SQRT(ALFA)  E: (10+NA)  M: (9+NA)
 0535                    27,3175  53657 C        SL*   SL*
 0536                    27,3176  57602 1              0 -4,2    X2=-NA
 0537                    27,3177  57602 1              0 -4,2
 0538                    27,3200  43257 C        SL*   DAD
 0539                    27,3201  57576 1              0,2
A0540                                                          TFF SQRT(MU) FROM PDL+0  E:(-45) M:(-42)
 0541                    27,3202  40005 C  ENDTFF DMP   BOV     TFF SQRT(MU) IN MPAC     E:(-45) M:(-42)
 0542  REF  7 LAST 1340 27,3203  00037 C              TFF/RTMU  E: (17)  M: (14)
 0543  REF  1           27,3204  57212 1              MAXTFF    SET POSMAX IF OVFL.

 0544                    27,3205  77616 C  DUMPTFF2 RVQ         RETURN  TFF   (-28) CS IN MPAC.
```

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```
 0545                          27,3206  77745 1  NEGTFF   DLOAD
A0546                                                              TFF SQRT(MU)  FROM PDL+0, NEGATIVE.
 0547                          27,3207  77650 1           GOTO
 0548  REF   2  LAST 1348     27,3210  57202 C                    ENDTFF

 0549                          27,3211  77745 1  MAXTFF1  DLOAD                 RESET PDL
 0550                          27,3212  43545 1  MAXTFF   DLOAD  RVQ
 0551  REF   5  LAST 1343     27,3213  17334 C                    NEARONE

R0552  TIME OF FLIGHT ELLIPSE WHEN DEL (ECCENTRIC ANOM) GEQ 90 AND LEQ -90.

A0553                                                              NUM FROM TFFX.  E: (-16) OR (-29)
A0554                                                                              M: (-15) OR (-27)
 0555                          27,3214  77712 C  TFFELL   SL2                   NUM  E:(-14) OR (-27)  M:(-13) OR (-25)
 0556                          27,3215  41465 C           BDDV   PUSH           TEMP SAVE D/N IN PDL+0
A0557                                                              DEN FROM PDL+0 E:(-3)/( 16) M:(-3)/(-15)
A0558                                                              N/D TO PDL+0  E: (11)  M: (10)
 0559                          27,3216  45345 1  TFFEL1   DLOAD  DSU            (ENTER WITH D/N=0 IN PDL+0)
 0560  REF   9  LAST 1348     27,3217  00045 0                    TFFTEM        Q2  E: (-16)  M: (-15)
 0561  REF   4  LAST 1348     27,3220  00017 1                    TFFQ1         Q1  E: (-16)  M: (-15)
 0562  REF   1                27,3221  14013 C           STODL    TFFDELQ       Q2-Q1  E: (-16)  M: (-15)
A0563                                                              D/N FROM PDL+0
 0564                          27,3222  77626 C           STADR
 0565  REF  10  LAST 1349     27,3223  77732 1           STORE    TFFTEM        D/N  E: (11)  M: (10)
 0566                          27,3224  53605 1           DMP      SL*
 0567  REF   4  LAST 1348     27,3225  00027 1                    TFF1/ALF      1/ALFA E: (-22-2NA)  M: (-20-2NA)
 0568                          27,3226  57576 1                    0,2           1/ALFA Z  E: (-11-NA)  M: (-10-NA)
 0569                          27,3227  41206 C  PUSH     DMP                    TO PDL+0
 0570  REF  11  LAST 1349     27,3230  00045 0                    TFFTEM        1/Z  E: (11)  M: (10)
 0571                          27,3231  41057 C  SL*      BOVB
 0572                          27,3232  57576 1                    0,2           X2= -NA
 0573  REF  16  LAST 1289     27,3233  45707 C                    SIGNMPAC      IN CASE X= 1.0, CONTINUE
 0574  REF   7  LAST 1348     27,3234  00043 0  STORE    TFFX                   X=1/ALFA ZSQ
 0575                          27,3235  41234 1  RTB      DMP
 0576  REF   2  LAST 1348     27,3236  57276 C                    T(X)          POLY
 0577  REF   8  LAST 1349     27,3237  00043 0                    TFFX
 0578                          27,3240  45242 1  SR3      DSU
 0579  REF   1                27,3241  17326 0                    DP2(-3)
 0580                          27,3242  41405 C  DMP      PUSH                   2(X T(X)-1) /Z ALFA  E: (-15-NA)
A0581                                                                                              M: (-14-NA)
A0582                                                              1/ALFA Z FROM PDL+0  E: (-11-NA)
A0583                                                                                              M: (-10-NA)
 0584                          27,3243  41345 C  DLOAD    DMP                    GET SIGN FOR SDELF
 0585  REF  12  LAST 1349     27,3244  00045 0                    TFFTEM        1/Z  E: (11)  M: (10)
 0586  REF   4  LAST 1348     27,3245  00015 0                    RMAG1         E: (-29)  M: (-27)
 0587                          27,3246  43312 C  SL2      DAD
 0588  REF   5  LAST 1349     27,3247  00017 1                    TFFQ1         Q1  E: (-16)  M: (-15)
 0589  REF  13  LAST 1349     27,3250  14045 C  STODL    TFFTEM                 (Q1+R 1/Z)  =SGN OF SDELF E:(-16) M:(-15
 0590  REF   7  LAST 1348     27,3251  00035 1                    TFFNP         LC P E: (-38+2NR) M: (-36+2NR)
 0591                          27,3252  53605 1  DMP      SL*                    CALC FOR ARC FOR TFF/TRIG.
```

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```
0592  REF  5  LAST 1349  27,3253  00027 1          TFF1/ALF   1/ALFA  E:(-22-2NA)  M:(-20-2NA)
0593                     27,3254  57575 1          1,2        X2=-NA
0594                     27,3255  53765 0    SIGN  SL*
0595  REF 14  LAST 1349  27,3256  00045 0          TFFTEM     AFFIX SIGN FOR SDELF
0596                     27,3257  57576 1          0,2
0597  REF 15  LAST 135C  27,3260  14045 0    STODL TFFTEM     P/ALFA  E:(-59+2NR)  M:(-55+2NR)
A0598                                             (ARG FOR USE IN TFF/TRIG)
0599  REF  6  LAST 135C  27,3261  00027 1          TFF1/ALF   1/ALFA E:(-22-2NA)  M:(-20-2NA)
0600                     27,3262  41366 1    SQRT  DMP
0601  REF  2  LAST 1348  27,3263  17320 0          PI/16      PI (-4)
0602                     27,3264  77615 0    DAD
A0603                                             2(XT(X)-1)/Z ALFA FROM PDL E:(-15-NA)
A0604                                                                    M:(-14-NA)
0605                     27,3265  45257 0    SL*   DSU
0606                     27,3266  57577 0          0 -1,2
0607  REF  2  LAST 1349  27,3267  00013 0          TFFDELQ    Q2-Q1  E: (-16)  M: (-15)
0608                     27,3270  53605 1    DMP   SL*
0609  REF  7  LAST 135C  27,3271  00027 1          TFF1/ALF   1/ALFA  E:(-22-2NA)  M:(-20-2NA)
0610                     27,3272  57601 1          0 -3,2
0611                     27,3273  52057 1    SL*   GOTO
0612                     27,3274  57602 1          0 -4,2
0613  REF  3  LAST 1349  27,3275  57202 0          ENDTFF     TFF SQRT(MU) IN MPAC E:(-45) M:(-42)
```

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```
R0614   PROGRAM NAME:      T(X)                                    DATE:    01.17.67
R0616   MOD NO:  0                                                LOG SECTION:    TIME OF FREE FALL
R0618   MOD BY:  RR BAIRNSFATHER
R0619   FUNCTIONAL DESCRIPTION:      THE POLYNOMIAL T(X) IS USED BY TIME OF FLIGHT SUBROUTINES  CALCTFF AND
R0621           CALCTPER TO APPROXIMATE THE SERIES
R0622                                  2     3
R0623                   1/3 -X/5 +X /7 -X /9 ...

R0624           WHERE  X = ALFA Z Z        IF ALFA Z Z  LEQ 1
R0625                  X = 1/(ALFA Z Z )  IF ALFA Z Z   G  1

R0626           ALSO   X IS NEG FOR HYPERBOLIC ORBITS
R0627                  X = 0 FOR PARABOLIC ORBITS
R0628                  X IS POSITIVE FOR ELLIPTIC ORBITS
R0629           FOR FLIGHT 278, THE POLYNOMIAL  T(X) IS FITTED OVER THE RANGE  (0,+1)  AND HAS A MAXIMUM
R0631           DEVIATION FROM THE SERIES OF  2 E-5       (T(X) IS A CHEBYCHEV  TYPE FIT AND WAS OBTAINED USING
R0633           MAC PROGRAM AUTCURFIT294RR8  AND IS VALID TO THE SAME TOLERANCE OVER THE RANGE  (-.08,+1). )
R0635   CALLING SEQUENCE:  RTB
R0636                              T(X)
R0637           C(MPAC) = X

R0638   SUBROUTINES CALLED:  NONE
R0639   NORMAL EXIT MODE:     TC    DANZIG
R0640   ALARMS:  NONE
R0641   OUTPUT:  C(MPAC) = T(X)
R0642   ERASABLE INITIALIZATION REQUIRED:
R0643           C(MPAC)  =  X
R0644   DEBRIS:  NONE

 0645   REF  10  LAST 1260    27,3276  0 7171 1  T(X)      TC      POLY
 0646                         27,3277   00004 0              DEC     4                    N-1
 0647                         27,3300   12525 0              2DEC    3.333333333 E-1
 0647                         27,3301   12525 0
 0648                         27,3302   71463 0              2DEC*   -1.999819135 E-1 *
 0648                         27,3303   57703 1
 0649                         27,3304   04423 0              2DEC*   1.418148467  E-1 *
 0649                         27,3305   17645 0
 0650                         27,3306   74604 0              2DEC*   -1.01310997  E-1 *
 0650                         27,3307   43667 1
 0651                         27,3310   01626 1              2DEC*   5.609004986  E-2 *
 0651                         27,3311   37256 1
 0652                         27,3312   77404 1              2DEC*   -1.536156925 E-2 *
 0652                         27,3313   52071 0
 0653   REF  67  LAST 1282    27,3314  0 6030 1  ENDT(X)   TC      DANZIG

 0654   REF   1               27,3314             TCDANZIG =      ENDT(X)
```

```
P0655   TFF CONSTANTS
 0656                       32,3776                    BANK   32

 0657   REF   1             27,2000                    SETLOC TOF-FF1
 0658                       27,3315                    BANK

A0659                                                          NOTE _ NOTE _ ADJUSTED MUE FOR NEAR EARTH TRAJ.

A0660                                          MUE     =      3.990 815 471 E10  M CUBE/CS SQ
A0661                                          RTMUE   =      1.997702549 E5 B-18*     MODIFIED EARTH MU

 0662                       27,3315  24775 1    1/RTMU  2DEC*  .5005750271 E-5 B17*     MODIFIED EARTH MU
 0662                       27,3316  30424 0
A0663                                                          NOTE _ NOTE _ ADJUSTED MUE FOR NEAR EARTH TRAJ.

A0664                                          MUM     =      4.902 778  E8     M CUBE /CS SQ

A0665                                          RTMUM   2DEC*  2.21422176 E4 B-18*
 0666                       27,3317  06220 1    PI/16   2DEC   3.141592653 B-4
 0666                       27,3320  37553 0
 0667                       27,3321  37777 1    LIM(-22) 2OCT  37777 37700      1.0 -8(-22)
 0667                       27,3322  37700 1
 0668                       27,3323  00000 1    DP(-22) 2OCT   00000 00100      8(-22)
 0668                       27,3324  00100 0
 0669                       27,3325  04000 0    DP2(-3) 2DEC   1  B-3
 0669                       27,3326  00000 1
 0670                       27,3327  02000 0    DP2(-4) 2DEC   1 B-4           1/16
 0670                       27,3330  00000 1
R0671   RPAD1    2DEC   6373338 B-29    M  (-29)  =20 909 901.57 FT

 0672   REF   5 LAST  534  22,3310                    RPAD1   =      RPAD
 0673                       27,3331  00305 1    R30OK   2DEC   6464778 B-29      (-29)  M
 0673                       27,3332  11205 0
 0674                       27,3333  37777 1    NEARONE 2DEC   .999999999
 0674                       27,3334  37777 1
 0675   REF  31 LAST 1319   26,3331             TFFZEROS EQUALS HI6ZEROS
 0676   REF   4 LAST  885   26,3321             TFF1/4   EQUALS HIDP1/4
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L STAR TABLES USER'S PAGE NO. 1 EO S3

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0001                    32,3776             BANK   32
0002  REF   1           14,2000             SETLOC STARTAB
0003                    14,3412             BANK

0004  REF   1                               COUNT  14/STARS

0500                    14,3412  15261 0    2DEC   +.8341953207 B-1  STAR 37   X
0500                    14,3413  27231 1
0501                    14,3414  74126 1    2DEC   -.2394362567 B-1  STAR 37   Y
0501                    14,3415  61161 0
0502                    14,3416  70032 1    2DEC   -.4967780649 B-1  STAR 37   Z
0502                    14,3417  54470 0
0503                    14,3420  15013 1    2DEC   +.8138753897 B-1  STAR 36   X
0503                    14,3421  10432 0
0504                    14,3422  67066 0    2DEC   -.5559063490 B-1  STAR 36   Y
0504                    14,3423  40370 1
0505                    14,3424  02550 0    2DEC   +.1690413589 B-1  STAR 36   Z
0505                    14,3425  31133 1
0506                    14,3426  07207 0    2DEC   +.4540570017 B-1  STAR 35   X
0506                    14,3427  24243 1
0507                    14,3430  67275 0    2DEC   -.5393383149 B-1  STAR 35   Y
0507                    14,3431  67544 0
0508                    14,3432  13261 0    2DEC   +.7091871552 B-1  STAR 35   Z
0508                    14,3433  25121 1
0509                    14,3434  05075 0    2DEC   +.3200014224 B-1  STAR 34   X
0509                    14,3435  16350 0
0510                    14,3436  70715 0    2DEC   -.4436740480 B-1  STAR 34   Y
0510                    14,3437  55404 1
0511                    14,3440  62466 1    2DEC   -.8371095679 B-1  STAR 34   Z
0511                    14,3441  54577 0
0512                    14,3442  10650 0    2DEC   +.5518160037 B-1  STAR 33   X
0512                    14,3443  17202 1
0513                    14,3444  63234 1    2DEC   -.7934422090 B-1  STAR 33   Y
0513                    14,3445  43704 0
0514                    14,3446  73710 0    2DEC   -.2568045150 B-1  STAR 33   Z
0514                    14,3447  50170 1
0515                    14,3450  07203 1    2DEC   +.4535361097 B-1  STAR 32   X
0515                    14,3451  13612 0
0516                    14,3452  61746 0    2DEC   -.8780537171 B-1  STAR 32   Y
0516                    14,3453  77370 0
0517                    14,3454  02343 1    2DEC   +.1527307006 B-1  STAR 32   Z
0517                    14,3455  05340 0
0518                    14,3456  03235 0    2DEC   +.2067145272 B-1  STAR 31   X
0518                    14,3457  14762 1
0519                    14,3460  62030 0    2DEC   -.8720349419 B-1  STAR 31   Y
0519                    14,3461  51212 1
0520                    14,3462  70715 0    2DEC   -.4436486945 B-1  STAR 31   Z
0520                    14,3463  64117 1
0521                    14,3464  01744 1    2DEC   +.1216171923 B-1  STAR 30   X
0521                    14,3465  11157 1
```

0522	14,3466	63531 0	2DEC	-.7703014754 B-1	STAR 30	Y	
0522	14,3467	66055 1					
0523	14,3470	12007 0	2DEC	+.6259751556 B-1	STAR 30	Z	
0523	14,3471	37503 0					
0524	14,3472	76145 0	2DEC	-.1126265542 B-1	STAR 29	X	
0524	14,3473	53477 0					
0525	14,3474	60372 1	2DEC	-.9694679589 B-1	STAR 29	Y	
0525	14,3475	43624 0					
0526	14,3476	03370 0	2DEC	+.2178236347 B-1	STAR 29	Z	
0526	14,3477	15121 1					
0527	14,3500	76123 0	2DEC	-.1147906312 B-1	STAR 28	X	
0527	14,3501	64245 0					
0528	14,3502	72437 1	2DEC	-.3399437395 B-1	STAR 28	Y	
0528	14,3503	45623 1					
0529	14,3504	61041 0	2DEC	-.9334138229 B-1	STAR 28	Z	
0529	14,3505	57124 1					
0530	14,3506	72275 1	2DEC	-.3518772846 B-1	STAR 27	X	
0530	14,3507	55365 1					
0531	14,3510	62641 0	2DEC	-.8239967165 B-1	STAR 27	Y	
0531	14,3511	72150 0					
0532	14,3512	70712 1	2DEC	-.4440853383 B-1	STAR 27	Z	
0532	14,3513	41542 1					
0533	14,3514	67363 0	2DEC	-.5328042377 B-1	STAR 26	X	
0533	14,3515	50441 0					
0534	14,3516	64426 0	2DEC	-.7159448596 B-1	STAR 26	Y	
0534	14,3517	77263 0					
0535	14,3520	07157 0	2DEC	+.4511569595 B-1	STAR 26	Z	
0535	14,3521	34056 0					
0536	14,3522	63326 0	2DEC	-.7862552143 B-1	STAR 25	X	
0536	14,3523	77723 1					
0537	14,3524	67516 1	2DEC	-.5216265404 B-1	STAR 25	Y	
0537	14,3525	72566 1					
0538	14,3526	05231 1	2DEC	+.3312227199 B-1	STAR 25	Z	
0538	14,3527	14031 0					
0539	14,3530	64753 1	2DEC	-.6899901699 B-1	STAR 24	X	
0539	14,3531	63156 0					
0540	14,3532	71237 1	2DEC	-.4180817959 B-1	STAR 24	Y	
0540	14,3533	42272 0					
0541	14,3534	66427 0	2DEC	-.5908647707 B-1	STAR 24	Z	
0541	14,3535	64260 1					
0542	14,3536	66546 0	2DEC	-.5811943804 B-1	STAR 23	X	
0542	14,3537	73302 1					
0543	14,3540	73261 0	2DEC	-.2907877154 B-1	STAR 23	Y	
0543	14,3541	73575 1					
0544	14,3542	14122 0	2DEC	+.7600365758 B-1	STAR 23	Z	
0544	14,3543	07016 1					
0545	14,3544	61247 1	2DEC	-.9171065276 B-1	STAR 22	X	
0545	14,3545	42015 0					
0546	14,3546	72314 1	2DEC	-.3500098785 B-1	STAR 22	Y	
0546	14,3547	67004 1					

0547	14,3550	74744 C	2DEC	-.1908106439 B-1	STAR 22	Z	
0547	14,3551	74104 1					
0548	14,3552	70605 C	2DEC	-.4524416631 B-1	STAR 21	X	
0548	14,3553	63103 C					
0549	14,3554	77154 1	2DEC	-.0492700670 B-1	STAR 21	Y	
0549	14,3555	54113 C					
0550	14,3556	61601 1	2DEC	-.8904319187 B-1	STAR 21	Z	
0550	14,3557	62472 1					
0551	14,3560	60604 C	2DEC	-.9525633510 B-1	STAR 20	X	
0551	14,3561	63166 C					
0552	14,3562	77033 1	2DEC	-.0591313500 B-1	STAR 20	Y	
0552	14,3563	63044 1					
0553	14,3564	73162 C	2DEC	-.2985406935 B-1	STAR 20	Z	
0553	14,3565	53261 1					
0554	14,3566	60431 1	2DEC	-.9656240240 B-1	STAR 19	X	
0554	14,3567	63350 1					
0555	14,3570	00660 1	2DEC	+.0528067543 B-1	STAR 19	Y	
0555	14,3571	22763 C					
0556	14,3572	04045 1	2DEC	+.2545224762 B-1	STAR 19	Z	
0556	14,3573	01424 1					
0557	14,3574	62165 1	2DEC	-.8606970465 B-1	STAR 18	X	
0557	14,3575	45335 C					
0558	14,3576	07327 C	2DEC	+.4638127405 B-1	STAR 18	Y	
0558	14,3577	21564 C					
0559	14,3600	03267 1	2DEC	+.2099484122 B-1	STAR 18	Z	
0559	14,3601	34557 1					
0560	14,3602	63472 C	2DEC	-.7741360248 B-1	STAR 17	X	
0560	14,3603	50705 C					
0561	14,3604	11661 C	2DEC	+.6154234025 B-1	STAR 17	Y	
0561	14,3605	21433 C					
0562	14,3606	75501 1	2DEC	-.1482142053 B-1	STAR 17	Z	
0562	14,3607	72421 C					
0563	14,3610	70431 C	2DEC	-.4656165921 B-1	STAR 16	X	
0563	14,3611	65316 C					
0564	14,3612	07510 1	2DEC	+.4775804724 B-1	STAR 16	Y	
0564	14,3613	12666 1					
0565	14,3614	13727 1	2DEC	+.7450624681 B-1	STAR 16	Z	
0565	14,3615	21520 C					
0566	14,3616	72161 1	2DEC	-.3611937602 B-1	STAR 15	X	
0566	14,3617	43161 C					
0567	14,3620	11144 C	2DEC	+.5748077840 B-1	STAR 15	Y	
0567	14,3621	32323 1					
0568	14,3622	64200 1	2DEC	-.7342581827 B-1	STAR 15	Z	
0568	14,3623	76476 C					
0569	14,3624	71323 C	2DEC	-.4116502629 B-1	STAR 14	X	
0569	14,3625	70264 C					
0570	14,3626	16403 1	2DEC	+.9066387314 B-1	STAR 14	Y	
0570	14,3627	05717 C					
0571	14,3630	01365 C	2DEC	+.0924676785 B-1	STAR 14	Z	
0571	14,3631	17662 C					

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0572                14,3632   75055 0        2DEC   -.1818957154 B-1   STAR 13    X
0572                14,3633   75101 0
0573                14,3634   17030 1        2DEC   +.9405318128 B-1   STAR 13    Y
0573                14,3635   32613 1
0574                14,3636   73321 0        2DEC   -.2869039173 B-1   STAR 13    Z
0574                14,3637   65667 0
0575                14,3640   77010 0        2DEC   -.0614360769 B-1   STAR 12    X
0575                14,3641   66714 0
0576                14,3642   11515 0        2DEC   +.6031700106 B-1   STAR 12    Y
0576                14,3643   05314 1
0577                14,3644   63215 1        2DEC   -.7952430739 B-1   STAR 12    Z
0577                14,3645   53630 1
0578                14,3646   02145 0        2DEC   +.1373948084 B-1   STAR 11    X
0578                14,3647   21163 0
0579                14,3650   12715 1        2DEC   +.6813398852 B-1   STAR 11    Y
0579                14,3651   21123 1
0580                14,3652   13401 0        2DEC   +.7189566241 B-1   STAR 11    Z
0580                14,3653   26125 0
0581                14,3654   03161 1        2DEC   +.2013426456 B-1   STAR 10    X
0581                14,3655   14610 0
0582                14,3656   17401 1        2DEC   +.9689888101 B-1   STAR 10    Y
0582                14,3657   36465 0
0583                14,3660   75552 1        2DEC   -.1432544058 B-1   STAR 10    Z
0583                14,3661   56556 1
0584                14,3662   05473 1        2DEC   +.3509587451 B-1   STAR  9    X
0584                14,3663   01565 0
0585                14,3664   16217 1        2DEC   +.8925545449 B-1   STAR  9    Y
0585                14,3665   31643 1
0586                14,3666   04417 1        2DEC   +.2831507435 B-1   STAR  9    Z
0586                14,3667   22211 0
0587                14,3670   06444 0        2DEC   +.4107492871 B-1   STAR  8    X
0587                14,3671   33354 0
0588                14,3672   07765 1        2DEC   +.4987190610 B-1   STAR  8    Y
0588                14,3673   20153 1
0589                14,3674   14154 1        2DEC   +.7632590132 B-1   STAR  8    Z
0589                14,3675   23613 1
0590                14,3676   13202 0        2DEC   +.7033883645 B-1   STAR  7    X
0590                14,3677   05024 1
0591                14,3700   13243 0        2DEC   +.7074274193 B-1   STAR  7    Y
0591                14,3701   07665 0
0592                14,3702   01067 1        2DEC   +.0692188921 B-1   STAR  7    Z
0592                14,3703   01242 1
0593                14,3704   10561 1        2DEC   +.5450662811 B-1   STAR  6    X
0593                14,3705   05666 1
0594                14,3706   10401 0        2DEC   +.5313738486 B-1   STAR  6    Y
0594                14,3707   00357 0
0595                14,3710   65477 0        2DEC   -.6484940879 B-1   STAR  6    Z
0595                14,3711   61124 1
0596                14,3712   00154 1        2DEC   +.0131955837 B-1   STAR  5    X
0596                14,3713   03111 0
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L STAR TABLES USER'S PAGE NO. 5 EO S3

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0597                14,3714   00077 1          2DEC   +.0078043793 B-1  STAR  5   Y
0597                14,3715   35676 C
0598                14,3716   17777 C          2DEC   +.9998824772 B-1  STAR  5   Z
0598                14,3717   01142 1
0599                14,3720   07674 C          2DEC   +.4917355618 B-1  STAR  4   X
0599                14,3721   11416 1
0600                14,3722   03415 1          2DEC   +.2203784481 B-1  STAR  4   Y
0600                14,3723   12707 1
0601                14,3724   62413 C          2DEC   -.8423950835 B-1  STAR  4   Z
0601                14,3725   43135 1
0602                14,3726   07511 C          2DEC   +.4776746280 B-1  STAR  3   X
0602                14,3727   03423 1
0603                14,3730   01672 C          2DEC   +.1164935557 B-1  STAR  3   Y
0603                14,3731   12054 C
0604                14,3732   15735 1          2DEC   +.8707790771 B-1  STAR  3   Z
0604                14,3733   15405 1
0605                14,3734   16745 C          2DEC   +.9342726691 B-1  STAR  2   X
0605                14,3735   21763 C
0606                14,3736   02613 1          2DEC   +.1732973829 B-1  STAR  2   Y
0606                14,3737   24675 C
0607                14,3740   73007 1          2DEC   -.3116128956 B-1  STAR  2   Z
0607                14,3741   50430 C
0608                14,3742   15777 1          2DEC   +.8749183324 B-1  STAR  1   X
0608                14,3743   12457 1
0609                14,3744   00324 1          2DEC   +.0258916990 B-1  STAR  1   Y
0609                14,3745   03265 C
0610                14,3746   07571 C          2DEC   +.4835778442 B-1  STAR  1   Z
0610                14,3747   17020 0
0611                14,3750   15325 1  CATLOG  DEC    6869
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L AGC BLOCK TWO SELF-CHECK USER'S PAGE NO. I EO 53

R0001 PROGRAM DESCRIPTION DATE 20 DECEMBER 1967
R0003 PROGRAM NAME - SELF-CHECK LOG SECTION AGC BLOCK TWO SELF-CHECK
R0005 MCD NO - 1 ASSEMBLY SUBROUTINE UTILITYM REV 25
R0007 MOD BY - GAUNTT

R0008 FUNCTIONAL DESCRIPTION

R0009 PROGRAM HAS TWO MAIN PARTS. THE FIRST IS SELF-CHECK WHICH RUNS AS A ZERO PRIORITY JOB WITH NO CORE SET, AS
R0011 PART OF THE BACK-UP IDLE LOOP. THE SECOND IS SHOW-BANKSUM WHICH RUNS AS A REGULAR EXECUTIVE JOB WITH ITS OWN
R0013 STARTING VERB.
R0014 THE PURPOSE OF SELF-CHECK IS TO CHECK OUT VARIOUS PARTS OF THE COMPUTER AS OUTLINED BELOW IN THE OPTIONS.
R0016 THE PURPOSE OF SHOW-BANKSUM IS TO DISPLAY THE SUM OF EACH BANK , ONE AT A TIME.
R0020 IN ALL THERE ARE 7 POSSIBLE OPTIONS IN THIS BLOCK II VERSION OF SELF-CHECK. MORE DETAIL DESCRIPTION MAY BE
R0022 FOUND IN E-2065 BLOCK II AGC SELF-CHECK AND SHOW BANKSUM BY EDWIN D. SMALLY DECEMBER 1966, AND ADDENDA 2 AND 3.
R0024 THE DIFFERENT OPTIONS ARE CONTROLLED BY PUTTING DIFFERENT NUMBERS IN THE SMODE REGISTER (NOUN 27). BELOW IS
R0026 A DESCRIPTION OF WHAT PARTS OF THE COMPUTER THAT ARE CHECKED BY THE OPTIONS, AND THE CORRESPONDING NUMBER, IN
R0028 OCTAL, TO LOAD INTO SMODE.
R0032 +-4 ERASABLE MEMORY
R0033 +-5 FIXED MEMORY
R0034 +-1,2,3,6,7,10 EVERYTHING IN OPTIONS 4 AND 5.
R0036 -0 SAME AS +-10 UNTIL AN ERROR IS DETECTED.
R0037 +0 NO CHECK, PUTS COMPUTER INTO THE BACKUP IDLE LOOP.

R0038 WARNINGS

R0039 USE OF E MEMORY RESERVED FOR SELF-CHECK (EVEN IN IDLE LOOP) AS TEMP STORAGE BY OTHER PROGRAMS IS DANGEROUS.
R0041 SMODE SET GREATER THAN OCT 10 PUTS COMPUTER INTO BACKUP IDLE LOOP.

R0042 CALLING SEQUENCE

R0043 TO CALL SELF-CHECK KEY IN
R0044 V 21 N 27 E OPTION NUMBER E
R0047 TO CALL SHOW-BANKSUM KEY IN
R0048 V 91 E DISPLAYS FIRST BANK
R0049 V 33 E PROCEED, DISPLAYS NEXT BANK

R0050 EXIT MODES, NORMAL AND ALARM

R0051 SELF-CHECK NORMALLY CONTINUES INDEFINITELY UNLESS THERE IS AN ERROR DETECTED. IF SO + OPTION NUMBERS PUT
R0053 COMPUTER INTO BACKUP IDLE LOOP, - OPTION NUMBERS RESTART THE OPTION.
R0054 THE -0 OPTION PROCEEDS FROM THE LINE FOLLOWING THE LINE WHERE THE ERROR WAS DETECTED.
R0057 SHOW-BANKSUM PROCEEDS UNTIL A TERMINATE IS KEYED IN (V 34 E). THE COMPUTER IS PUT INTO THE BACKUP IDLE LOOP
R0059

R0060 OUTPUT

R0061 SELF-CHECK UPON DETECTING AN ERROR LOADS THE SELF-CHECK ALARM CONSTANT (01102) INTO THE FAILREG SET AND
R0063 TURNS ON THE ALARM LIGHT. THE OPERATOR MAY THEN DISPLAY THE THREE FAILREGS BY KEYING IN V 05 N 09 E. FOR FURTHER
R0065 INFORMATION HE MAY KEY IN V 05 N 08 E, THE DSKY DISPLAY IN R1 WILL BE ADDRESS+1 OF WHERE THE ERROR WAS DETECTED,
R0067 IN R2 THE BBCON OF SELF-CHECK, AND IN R3 THE TOTAL NUMBER OF ERRORS DETECTED BY SELF-CHECK SINCE THE LAST MAN
R0069 INITIATED FRESH START (SLAP1).
R0073 SHOW-BANKSUM STARTING WITH BANK 0 DISPLAYS IN R1 THE BANK SUM (A +-NUMBER EQUAL TO THE BANK NUMBER), IN R2
R0075 THE BANK NUMBER, AND IN R3 THE BUGGER WORD.

R0076 ERASABLE INITIALIZATION REQUIRED

R0077 ACCOMPLISHED BY FRESH START
R0078 $MODE SET TO +0

R0079 CHECKS

R0080 ALL EXITS FROM THE CHECK OF ERASABLE (ERASCHK) RESTORE ORIGINAL CONTENTS TO REGISTERS UNDER CHECK.
R0082 EXCEPTION IS A RESTART. RESTART THAT OCCURS DURING ERASCHK RESTORES ERASABLE, UNLESS THERE IS EVIDENCE TO DOUBT
R0084 E MEMORY, IN WHICH CASE PROGRAM THEN DOES A FRESH START (DOFSTART).

```
0085                    25,3766                 BANK    25
0086  REF   1          43,2000                 SETLOC  SELFCHEC
0087                    43,3227                 BANK

0088  REF   1                                  COUNT   43/SELF

0089  REF   76  LAST 1171      4712            SBIT1   EQUALS  BIT1
0090  REF   44  LAST 1171      4711            SBIT2   EQUALS  BIT2
0091  REF   33  LAST 1171      4710            SBIT3   EQUALS  BIT3
0092  REF   40  LAST 1171      4707            SBIT4   EQUALS  BIT4
0093  REF   39  LAST 1086      4706            SBIT5   EQUALS  BIT5
0094  REF   45  LAST 1128      4705            SBIT6   EQUALS  BIT6
0095  REF   51  LAST 1168      4704            SBIT7   EQUALS  BIT7
0096  REF   28  LAST 1193      4703            SBIT8   EQUALS  BIT8
0097  REF   32  LAST 1007      4702            SBIT9   EQUALS  BIT9
0098  REF   38  LAST 1171      4701            SBIT10  EQUALS  BIT10
0099  REF   34  LAST 1171      4700            SBIT11  EQUALS  BIT11
0100  REF   31  LAST 1171      4677            SBIT12  EQUALS  BIT12
0101  REF   44  LAST 1171      4676            SBIT13  EQUALS  BIT13
0102  REF   75  LAST 1331      4675            SBIT14  EQUALS  BIT14
0103  REF   49  LAST 1171      4674            SBIT15  EQUALS  BIT15

0104  REF 248  LAST 1290      4714            S+ZERO  EQUALS  ZERO
0105  REF   77  LAST 1359      4712            S+1     EQUALS  BIT1
0106  REF   45  LAST 1359      4711            S+2     EQUALS  BIT2
0107  REF   45  LAST 1333      6214            S+3     EQUALS  THREE
0108  REF   19  LAST 1331      4710            S+4     EQUALS  FOUR
0109  REF   27  LAST 1106      4715            S+5     EQUALS  FIVE
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0110   REF  40  LAST 1334      6211            S+6      EQUALS SIX
0111   REF  18  LAST 1171      4716            S+7      EQUALS SEVEN
0112   REF  13  LAST 1161      4373            S8BITS   EQUALS LOW8      00377
0113   REF   4  LAST 1059      4726            CNTRCON  =      OCT50     USED IN CNTRCHK
0114                        43,3227  00061 0    ERASCON1 OCTAL  00061     USED IN ERASCHK
0115                        43,3230  01373 1    ERASCON2 OCTAL  01373     USED IN ERASCHK
0116   REF   8  LAST 1171      4744            ERASCON6 =      OCT1400   USED IN ERASCHK
0117                        43,3231  01461 0    ERASCON3 OCTAL  01461     USED IN ERASCHK
0118                        43,3232  01773 0    ERASCON4 OCTAL  01773     USED IN ERASCHK
0119   REF  19  LAST 1096      4747            S10BITS  EQUALS LOW10     01777, USED IN ERASCHK
0120   REF   4  LAST  916      4755            SBNKO3   EQUALS PR106     06000, USED IN ROPECHK
0121   REF   6  LAST 1171      4364            -MAXADRS =      HI5       FOR ROPECHK
0122                        43,3233  00060 1    SIXTY    OCTAL  00060
0123                        43,3234  60017 1    SUPRCON  OCTAL  60017     USED IN ROPECHK
0124                        43,3235  17777 0    S13BITS  OCTAL  17777
0125                        43,3236  25252 0    CONC+S1  OCTAL  25252     USED IN CYCLSHFT
0126                        43,3237  52400 1    CONC+S2  OCTAL  52400     USED IN CYCLSHFT
0127                        43,3240  76777 1    ERASCON5 OCTAL  76777
0128   REF   2  LAST  198      5630            S-7      =      OCT77770
0129   REF   3  LAST 1080      6061            S-4      EQUALS NEG4
0130   REF   3  LAST  567      7714            S-3      EQUALS NEG3
0131   REF   6  LAST 1175      7715            S-2      EQUALS NEG2
0132   REF  29  LAST 1171      7716            S-1      EQUALS NEGONE
0133   REF  15  LAST 1068      4713            S-ZERO   EQUALS NEG0

0134   REF  46  LAST 1202      E3,1400                  EBANK= LST1
0135   REF   3  LAST  256      43,3241  01371 0  ADRS1    ADRES  SKEEP1
0136   REF   4  LAST 1187      43,3242  03333 1  SELFADRS ADRES  SELFCHK    SELFCHK RETURN ADDRESS. SHOULD BE PUT
A0137                                                                      IN SELFRET WHEN GOING FROM SELFCHK TO
A0138                                                                      SHOWSUM AND PUT IN SKEEP1 WHEN GOING
A0139                                                                      FROM SHOWSUM TO SELF-CHECK.

0140   REF   6  LAST  181      43,3243  3 1360 0  PRERRORS CA     ERESTORE  IS IT NECESSARY TO RESTORE ERASABLE
0141                        43,3244  0 0006 1           EXTEND
0142   REF   1              43,3245  1 3254 0           BZF    ERRORS    NO
0143                        43,3246  0 0006 1           EXTEND
0144   REF   3  LAST  181      43,3247  3 1376 1           DCA    SKEEP5
0145   REF   3  LAST  181      43,3250  51'377 0           INDEX  SKEEP7
0146                        43,3251  52 001 1           DXCH   0000      RESTORE THE TWO ERASABLE REGISTERS
0147   REF   2  LAST  256      43,3252  3 4714 1           CA     S+ZERO
0148   REF   7  LAST 1360      43,3253  55'360 1           TS     ERESTORE
0149                        43,3254  0 0004 0  ERRORS   INHINT
0150   REF 302  LAST 1283      43,3255  3 0002 0           CA     Q
0151   REF   3  LAST  380      43,3256  55'357 0           TS     SFAIL     SAVE Q FOR FAILURE LOCATION
0152   REF   3  LAST  264      43,3257  55'363 1           TS     ALMCADR   FOR DISPLAY WITH BBANK AND ERCOUNT
0153   REF   3  LAST  178      43,3260  25'365 0           INCR   ERCOUNT   KEEP TRACK OF NUMBER OF MALFUNCTIONS.
0154   REF   1              43,3261  0 5541 1  TCALARM2 TC     ALARM2
0155                        43,3262   01102 0           OCT    01102     SELF-CHECK MALFUNCTION INDICATOR
0156   REF   5  LAST  264      43,3263  11'362 0           CCS    SMODE
0157   REF   3  LAST 1360      43,3264  3 4714 1  SIDLOOP  CA     S+ZERO
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0158   REF   6  LAST 1360   43,3265  55'362 0          TS      SMODE
0159   REF   5  LAST 1360   43,3266  0 3333 1          TC      SELFCHK         GO TO IDLE LOOP
0160   REF   4  LAST 1360   43,3267  0 1357 1          TC      SFAIL           CONTINUE WITH SELF-CHECK

0161   REF 340  LAST 1334   43,3270  10 000 0  -1CHK    CCS     A
0162   REF   1               43,3271  1 3243 0          TCF     PRERRORS
0163   REF   2  LAST 1361   43,3272  1 3243 0          TCF     PRERRORS
0164   REF 341  LAST 1361   43,3273  10 000 0          CCS     A
0165   REF   3  LAST 1361   43,3274  1 3243 0          TCF     PRERRORS
0166   REF 303  LAST 1360   43,3275  0 0002 0          TC      Q

0167                        43,3276  0 0006 1  SMODECHK EXTEND
0168   REF   4  LAST 1360   43,3277  23'371 0          QXCH    SKEEP1
0169   REF   1               43,3300  0 3327 1          TC      CHECKNJ         CHECK FOR NEW JOB
0170   REF   7  LAST 1361   43,3301  11'362 0          CCS     SMODE
0171   REF   1               43,3302  0 3307 0          TC      SOPTIONS
0172   REF   1               43,3303  0 3300 1          TC      SMODECHK +2     TO BACKUP IDLE LOOP
0173   REF   2  LAST 1361   43,3304  0 3307 0          TC      SOPTIONS
0174   REF   2  LAST   79   43,3305  25'366 0          INCR    SCOUNT
0175   REF   5  LAST 1361   43,3306  0 1371 0          TC      SKEEP1          CONTINUE WITH SELF-CHECK

0176   REF   1               43,3307  6 5630 1  SOPTIONS AD     S-7
0177                        43,3310  0 0006 1          EXTEND
0178                        43,3311  6 3313 0          BZMF    +2              FOR OPTIONS BELOW NINE.
0179   REF   1               43,3312  0 3264 1  BNKOPTN TC      SIDLOOP         ILLEGAL OPTION.  GO TO IDLE LOOP.
0180   REF   3  LAST 1361   43,3313  25'366 0          INCR    SCOUNT          FOR OPTIONS BELOW NINE.
0181   REF   1               43,3314  6 4716 0          AD      S+7

0182   REF 342  LAST 1361   43,3315  50 000 1          INDEX   A
0183   REF   1               43,3316  0 3317 1          TC      SOPTION1
0184   REF   6  LAST 1361   43,3317  0 1371 0  SOPTION1 TC      SKEEP1          WAS TC+TCF
0185   REF   7  LAST 1361   43,3320  0 1371 0  SOPTION2 TC      SKEEP1          WAS IN:OUT1
0186   REF   8  LAST 1361   43,3321  0 1371 0  SOPTION3 TC      SKEEP1          WAS COUNTCHK
0187   REF   1               43,3322  0 3334 0  SOPTION4 TC      ERASCHK
0188   REF   1               43,3323  0 3515 0  SOPTION5 TC      ROPECHK
0189   REF   9  LAST 1361   43,3324  0 1371 0  SOPTION6 TC      SKEEP1
0190   REF  10  LAST 1361   43,3325  0 1371 0  SOPTION7 TC      SKEEP1
0191   REF  11  LAST 1361   43,3326  0 1371 0  SOPTON10 TC      SKEEP1          CONTINUE WITH SELF-CHECK

0192                        43,3327  0 0006 1  CHECKNJ  EXTEND
0193   REF   7  LAST 1187   43,3330  23'361 1          QXCH    SELFRET         SAVE RETURN ADDRESS WHILE TESTING NEWJOB
0194   REF  61  LAST 1227   43,3331  0 4574 0          TC      POSTJUMP        TO SEE IF ANY JOBS HAVE BECOME ACTIVE.
0195   REF   2  LAST 1182   43,3332   03231 1          CADR    ADVAN

0196   REF   2  LAST 1361   43,3333  0 3276 1  SELFCHK  TC      SMODECHK        ** CHARLEY, COME IN HERE

R0197  SKEEP7 HOLDS LOWEST OF TWO ADDRESSES BEING CHECKED.
R0198  SKEEP6 HOLDS B(X+1).
R0199  SKEEP5 HOLDS B(X).
R0200  SKEEP4 HOLDS C(EBANK) DURING ERASLOOP AND CHECKNJ.
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R0201   SKEEP3 HOLDS LAST ADDRESS BEING CHECKED (HIGHEST ADDRESS).
R0202   SKEEP2 CONTROLS CHECKING OF NON-SWITCHABLE ERASABLE MEMORY WITH BANK NUMBERS IN EB.
R0204   ERASCHK TAKES APPROXMATELY 7 SECONDS
 0205   REF   2  LAST  256   43,3334  3 4712 1  ERASCHK  CA    S+1
 0206   REF   3  LAST  256   43,3335  55'372 1           TS    SKEEP2
 0207   REF   4  LAST 1360   43,3336  3 4714 1  QEBANK   CA    S+ZERO
 0208   REF  51  LAST 1161   43,3337  54 003 0           TS    EBANK
 0209   REF   1              43,3340  3 3231 1           CA    ERASCON3      01461
 0210   REF   4  LAST 1360   43,3341  55'377 1           TS    SKEEP7        STARTING ADDRESS
 0211   REF   1              43,3342  3 4747 1           CA    S10BITS       01777
 0212   REF   3  LAST  256   43,3343  55'373 0           TS    SKEEP3        LAST ADDRESS CHECKED
 0213   REF   1              43,3344  0 3364 0           TC    ERASLOOP

 0214   REF   1              43,3345  3 4744 1  E1345678 CA    ERASCON6      01400
 0215   REF   5  LAST 1362   43,3346  55'377 1           TS    SKEEP7        STARTING ADDRESS
 0216   REF   2  LAST 1362   43,3347  3 4747 1           CA    S10BITS       01777
 0217   REF   4  LAST 1362   43,3350  55'373 0           TS    SKEEP3        LAST ADDRESS CHECKED
 0218   REF   2  LAST 1362   43,3351  0 3364 0           TC    ERASLOOP

 0219   REF   2  LAST 1362   43,3352  3 4744 1  2EBANK   CA    ERASCON6      01400
 0220   REF   6  LAST 1362   43,3353  55'377 1           TS    SKEEP7        STARTING ADDRESS
 0221   REF   1              43,3354  3 3232 1           CA    ERASCON4      01773
 0222   REF   5  LAST 1362   43,3355  55'373 0           TS    SKEEP3        LAST ADDRESS CHECKED
 0223   REF   3  LAST 1362   43,3356  0 3364 0           TC    ERASLOOP

 0224   REF   4  LAST 1362   43,3357  55'372 1  NOEBANK  TS    SKEEP2        +0
 0225   REF   1              43,3360  3 3227 0           CA    ERASCON1      00061
 0226   REF   7  LAST 1362   43,3361  55'377 1           TS    SKEEP7        STARTING ADDRESS
 0227   REF   1              43,3362  3 3230 0           CA    ERASCON2      01373
 0228   REF   6  LAST 1362   43,3363  55'373 0           TS    SKEEP3        LAST ADDRESS CHECKED

 0229                        43,3364  0 0004 0  ERASLOOP INHINT
 0230   REF  52  LAST 1362   43,3365  3 0003 1           CA    EBANK         STORES C(EBANK)
 0231   REF   3  LAST  181   43,3366  55'374 1           TS    SKEEP4
 0232                        43,3367  0 0006 1           EXTEND
 0233   REF   8  LAST 1362   43,3370  5 1377 0           NDX   SKEEP7
 0234                        43,3371  3 0001 0           DCA   0000
 0235   REF   4  LAST 1360   43,3372  53'376 0           DXCH  SKEEP5        STORES C(X) AND C(X+1) IN SKEEP6 AND 5.
 0236   REF   9  LAST 1362   43,3373  3 1377 0           CA    SKEEP7
 0237   REF   8  LAST 1360   43,3374  55'360 1           TS    ERESTORE      IF RESTART, RESTORE C(X) AND C(X+1)
 0238   REF 211  LAST 1290   43,3375  54 001 1           TS    L
 0239   REF 212  LAST 1362   43,3376  24 001 0           INCR  L
 0240   REF 343  LAST 1361   43,3377  50 000 1           NDX   A
 0241                        43,3400  52 001 1           DXCH  0000          PUTS OWN ADDRESS IN X AND X +1
 0242   REF  10  LAST 1362   43,3401  51'377 0           NDX   SKEEP7
 0243                        43,3402  4 0001 1           CS    0001          CS  X+1
 0244   REF  11  LAST 1362   43,3403  51'377 0           NDX   SKEEP7
 0245                        43,3404  6 0000 1           AD    0000          AD X
 0246   REF   1              43,3405  0 3270 1           TC    -ICHK
 0247   REF   9  LAST 1362   43,3406  3 1360 0           CA    ERESTORE      HAS ERASABLE BEEN RESTORED
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0248                          43,3407  0 0006 1          EXTEND
0249  REF   1                 43,3410  1 3434 0          BZF     ELOOPFIN        YES, EXIT ERASLOOP.
0250                          43,3411  0 0006 1          EXTEND
0251  REF  12  LAST 1362     43,3412  5 1377 0          NDX     SKEEP7
0252                          43,3413  4 0001 1          DCS     0000            COMPLEMENT OF ADDRESS OF X AND X+1
0253  REF  13  LAST 1363     43,3414 51'377 0           NDX     SKEEP7
0254                          43,3415 52 001 1           DXCH    0000            PUT COMPLEMENT OF ADDRESS OF X AND X+1
0255  REF  14  LAST 1363     43,3416 51'377 0           NDX     SKEEP7
0256                          43,3417  4 0000 0          CS      0000            CS  X
0257  REF  15  LAST 1363     43,3420 51'377 0           NDX     SKEEP7
0258                          43,3421  6 0001 0          AD      0001            AD X+1
0259  REF   2  LAST 1362     43,3422  0 3270 1          TC      -1CHK
0260  REF  10  LAST 1362     43,3423  3 1360 0          CA      ERESTORE        HAS ERASABLE BEEN RESTORED
0261                          43,3424  0 0006 1          EXTEND
0262  REF   2  LAST 1363     43,3425  1 3434 0          BZF     ELOOPFIN        YES, EXIT ERASLOOP.
0263                          43,3426  0 0006 1          EXTEND
0264  REF   5  LAST 1362     43,3427  3 1376 1          DCA     SKEEP5
0265  REF  16  LAST 1363     43,3430 51'377 0           NDX     SKEEP7
0266                          43,3431 52 001 1           DXCH    0000            PUT B(X) AND B(X+1) BACK INTO X AND X+1
0267  REF   5  LAST 1362     43,3432  3 4714 1          CA      S+ZERO
0268  REF  11  LAST 1363     43,3433 55'360 1          TS      ERESTORE        IF RESTART, DO NOT RESTORE C(X), C(X+1)
0269                          43,3434  0 0003 1 ELOOPFIN RELINT
0270  REF   2  LAST 1361     43,3435  0 3327 1          TC      CHECKNJ         CHECK FOR NEW JOB
0271  REF   4  LAST 1362     43,3436  3 1374 0          CA      SKEEP4          REPLACES B(EBANK)
0272  REF  53  LAST 1362     43,3437 54 003 0           TS      EBANK
0273  REF  17  LAST 1363     43,3440 25'377 0           INCR    SKEEP7
0274  REF  18  LAST 1363     43,3441  4 1377 1          CS      SKEEP7
0275  REF   7  LAST 1362     43,3442  6 1373 1          AD      SKEEP3
0276                          43,3443  0 0006 1          EXTEND
0277                          43,3444  1 3446 0          BZF     +2
0278  REF   4  LAST 1362     43,3445  0 3364 0          TC      ERASLOOP        GO TO NEXT ADDRESS IN SAME BANK
0279  REF   5  LAST 1362     43,3446 11'372 1           CCS     SKEEP2
0280  REF   1                 43,3447  0 3357 0          TC      NOEBANK
0281  REF   6  LAST 1363     43,3450 25'372 0           INCR    SKEEP2          PUT +1 IN SKEEP2.
0282  REF  54  LAST 1363     43,3451  3 0003 1          CA      EBANK
0283  REF   1                 43,3452  6 4702 0          AD      SBIT9
0284  REF  55  LAST 1363     43,3453 54 003 0           TS      EBANK
0285  REF   1                 43,3454  6 3240 1          AD      ERASCON5        76777, CHECK FOR BANK E2
0286                          43,3455  0 0006 1          EXTEND
0287  REF   1                 43,3456  1 3352 1          BZF     2EBANK
0288  REF  56  LAST 1363     43,3457 10 003 0           CCS     EBANK
0289  REF   1                 43,3460  0 3345 0          TC      E1345678        GO TO EBANKS 1,3,4,5,6, AND 7
0290  REF   3  LAST 1362     43,3461  3 4744 1          CA      ERASCON6        END OF ERASCHK
0291  REF  57  LAST 1363     43,3462 54 003 0           TS      EBANK
R0292 CNTRCHK PERFORMS A CS OF ALL REGISTERS FROM OCT. 60 THROUGH OCT. 10.
R0293 INCLUDED ARE ALL COUNTERS, T6-1, CYCLE AND SHIFT, AND ALL RUPT REGISTERS
0294  REF   1                 43,3463  3 4726 0 CNTRCHK  CA      CNTRCON         00050
0295  REF   7  LAST 1363     43,3464 55'372 1 CNTRLOOP TS      SKEEP2
0296  REF   1                 43,3465  6 4707 0          AD      SBIT4           +10 OCTAL
0297  REF 344  LAST 1362     43,3466 50 000 1          INDEX   A
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0298                          43,3467  4 0000 C          CS      0000
0299   REF   8  LAST 1363     43,3470  11'372 1          CCS     SKEEP2
0300   REF   1                43,3471  0 3464 1          TC      CNTRLOOP

R0301  CYCLSHFT CHECKS THE CYCLE AND SHIFT REGISTERS
0302   REF   1                43,3472  3 3236 C  CYCLSHFT CA      CONC+S1         25252
0303   REF  42  LAST 1163     43,3473  54 020 1          TS      CYR             C(CYR) = 12525
0304   REF  22  LAST 1153     43,3474  54 022 C          TS      CYL             C(CYL) = 52524
0305   REF  29  LAST 1153     43,3475  54 021 C          TS      SR              C(SR) = 12525
0306   REF  11  LAST 1075     43,3476  54 023 1          TS      EDOP            C(EDOP) = 00125
0307   REF  43  LAST 1364     43,3477  6 0020 C          AD      CYR             37777           C(CYR) = 45252
0308   REF  23  LAST 1364     43,3500  6 0022 1          AD      CYL             00-12524        C(CYL) = 25251
0309   REF  30  LAST 1364     43,3501  6 0021 1          AD      SR              00-25251        C(SR) = 05252
0310   REF  12  LAST 1364     43,3502  6 0023 C          AD      EDOP            00-25376        C(EDOP) = +0
0311   REF   1                43,3503  6 3237 1          AD      CONC+S2         C(CONC+S2) = 52400
0312   REF   3  LAST 1363     43,3504  0 3270 1          TC      -1CHK
0313   REF  44  LAST 1364     43,3505  6 0020 C          AD      CYR             45252
0314   REF  24  LAST 1364     43,3506  6 0022 1          AD      CYL             72523
0315   REF  31  LAST 1364     43,3507  6 0021 1          AD      SR              77775
0316   REF  13  LAST 1364     43,3510  6 0023 C          AD      EDOP            77775
0317   REF   3  LAST 1362     43,3511  6 4712 1          AD      S+1             77776
0318   REF   4  LAST 1364     43,3512  0 3270 1          TC      -1CHK

0319   REF   4  LAST 1361     43,3513  25'367 1          INCR    SCOUNT +1
0320   REF   3  LAST 1361     43,3514  0 3276 1          TC      SMODECHK
R0321  SKEEP1 HOLDS SUM
R0322  SKEEP2 HOLDS PRESENT CONTENTS OF ADDRESS IN ROPECHK AND SHOWSUM ROUTINES
R0323  SKEEP2 HOLDS BANK NUMBER IN LOW ORDER BITS DURING SHOWSUM DISPLAY
R0324  SKEEP3 HOLDS PRESENT ADDRESS (00000 TO 01777 IN COMMON FIXED BANKS)
R0325                              (04000 TO 07777 IN FXFX BANKS)
R0326  SKEEP3 HOLDS BLOGGER WORD DURING SHOWSUM DISPLAY
R0327  SKEEP4 HOLDS BANK NUMBER AND SUPER BANK NUMBER
R0328  SKEEP5 COUNTS 2 SUCCESSIVE TC SELF WORDS
R0329  SKEEP6 CONTROLS ROPECHK OR SHOWSUM OPTION
R0330  SKEEP7 CONTROLS WHEN ROUNTINE IS IN COMMON FIXED OR FIXED FIXED BANKS

0331   REF   1                43,3515  3 4713 C  ROPECHK CA      S-ZERO          *
03311  REF   4  LAST  256     43,3516  55'376 C          TS      SKEEP6          * -0 FOR ROPECHK.
03312  REF   6  LAST 1363     43,3517  3 4714 1  STSHOSUM CA      S+ZERO          * SHOULD BE ROPECHK

0332   REF   5  LAST 1363     43,3520  55'374 1          TS      SKEEP4          BANK NUMBER
0333   REF   4  LAST 1364     43,3521  3 4712 1          CA      S+1
0334   REF  19  LAST 1363     43,3522  55'377 1  COMMFX  TS      SKEEP7
0335   REF   7  LAST 1364     43,3523  3 4714 1          CA      S+ZERO
0336   REF  12  LAST 1361     43,3524  55'371 1          TS      SKEEP1
0337   REF   8  LAST 1363     43,3525  55'373 C          TS      SKEEP3
0338   REF   5  LAST 1364     43,3526  3 4712 1          CA      S+1
0339   REF   6  LAST 1363     43,3527  55'375 C          TS      SKEEP5          COUNTS DOWN 2 TC SELF WORDS
0340   REF   6  LAST 1364     43,3530  3 1374 C  COMADRS  CA      SKEEP4
0341   REF 213  LAST 1362     43,3531  54 001 1          TS      L               TO SET SUPER BANK
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L AGC BLOCK TWO SELF-CHECK USER'S PAGE NO. 8 E3 S4

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0342   REF   7  LAST 1360   43,3532  7 4364 0          MASK   HI5
0343   REF   9  LAST 1364   43,3533  6 1373 1          AD     SKEEP3
0344   REF   2  LAST  350   43,3534  0 4610 1          TC     SUPDACAL      SUPER DATA CALL
0345   REF   1              43,3535  0 3560 1          TC     ADSUM
0346   REF   1              43,3536  6 4700 1          AD     SBIT11        02000
0347   REF   1              43,3537  0 3571 1          TC     ADRSCHK

0348   REF 345  LAST 1363   43,3540  4 0000 0  FXFX    CS     A
0349   REF  20  LAST 1364   43,3541  55'377 1          TS     SKEEP7
0350                        43,3542  0 0006 1          EXTEND
0351                        43,3543  1 3546 1          BZF    +3
0352   REF   1              43,3544  3 4677 0          CA     SBIT12        04000, STARTING ADDRESS OF BANK 02
0353                        43,3545  0 3547 1          TC     +2
0354   REF   1              43,3546  3 4755 1          CA     SBNK03        06000, STARTING ADDRESS OF BANK 03
0355   REF  10  LAST 1365   43,3547  55'373 0          TS     SKEEP3
0356   REF   8  LAST 1364   43,3550  3 4714 1          CA     S+ZERO
0357   REF  13  LAST 1364   43,3551  55'371 1          TS     SKEEP1
0358   REF   6  LAST 1364   43,3552  3 4712 1          CA     S+1
0359   REF   7  LAST 1364   43,3553  55'375 0          TS     SKEEP5        COUNTS DOWN 2 TC SELF WORDS
0360   REF  11  LAST 1365   43,3554  51'373 1  FXADRS  INDEX  SKEEP3
0361                        43,3555  3 0000 1          CA     0000
0362   REF   2  LAST 1365   43,3556  0 3560 1          TC     ADSUM
0363   REF   2  LAST 1365   43,3557  0 3571 1          TC     ADRSCHK

0364   REF   9  LAST 1364   43,3560  55'372 1  ADSUM   TS     SKEEP2
0365   REF  14  LAST 1365   43,3561  6 1371 0          AD     SKEEP1
0366   REF  15  LAST 1365   43,3562  55'371 1          TS     SKEEP1
0367   REF   9  LAST 1365   43,3563  3 4714 1          CAF    S+ZERO
0368   REF  16  LAST 1365   43,3564  6 1371 0          AD     SKEEP1
0369   REF  17  LAST 1365   43,3565  55'371 1          TS     SKEEP1
0370   REF  10  LAST 1365   43,3566  4 1372 1          CS     SKEEP2
0371   REF  12  LAST 1365   43,3567  6 1373 1          AD     SKEEP3
0372   REF 304  LAST 1361   43,3570  0 0002 0          TC     Q

0373   REF 346  LAST 1365   43,3571  22 000 1  ADRSCHK  LXCH   A
0374   REF  13  LAST 1365   43,3572  3 1373 1          CA     SKEEP3
0375   REF  20  LAST 1360   43,3573  7 4747 0          MASK   LOW10         RELATIVE ADDRESS
0376   REF   1              43,3574  6 4364 1          AD     -MAXADRS      SUBTRACT MAX RELATIVE ADDRESS = 1777.
0377                        43,3575  0 0006 1          EXTEND
0378   REF   1              43,3576  1 3665 0          BZF    SOPTION       CHECKSUM FINISHED IF LAST ADDRESS.
0379   REF   8  LAST 1365   43,3577  11'375 0          CCS    SKEEP5        IS CHECKSUM FINISHED
0380                        43,3600  0 3603 1          TC     +3            NO
0381                        43,3601  0 3603 1          TC     +2            NO
0382   REF   2  LAST 1365   43,3602  0 3665 1          TC     SOPTION       GO TO ROPECHK SHOWSUM OPTION
0383   REF 214  LAST 1364   43,3603  10 001 1          CCS    L             -0 MEANS A TC SELF WORD.
0384   REF   1              43,3604  0 3613 0          TC     CONTINU
0385   REF   2  LAST 1365   43,3605  0 3613 0          TC     CONTINU
0386   REF   3  LAST 1365   43,3606  0 3613 0          TC     CONTINU
0387   REF   9  LAST 1365   43,3607  11'375 0          CCS    SKEEP5
0388   REF   4  LAST 1365   43,3610  0 3614 1          TC     CONTINU +1
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0389  REF   1                 43,3611  3 7716 0           CA    S-1
0390  REF   5  LAST 1365      43,3612  0 3614 1           TC    CONTINU +1      AD IN THE BUGGER WORD
0391  REF   7  LAST 1365      43,3613  3 4712 1  CONTINU  CA    S+1             MAKE SURE TWO CONSECUTIVE TC SELF WORDS
0392  REF  10  LAST 1365      43,3614  55'375 0           TS    SKEEP5
03921 REF   5  LAST 1364      43,3615  11'376 0           CCS   SKEEP6          *
03922 REF  21  LAST 1187      43,3616  10 067 1           CCS   NEWJCB          * +1, SHOWSUM
03923 REF   4  LAST  825      43,3617  0 5057 0           TC    CHANG1          *
03924                         43,3620  0 3622 1           TC    +2              *
0393  REF   3  LAST 1363      43,3621  0 3327 1           TC    CHECKNJ         -0 IN SKEEP6 FOR ROPECHK

0394  REF  14  LAST 1365      43,3622  25'373 1  ADRS+1   INCR  SKEEP3
0395  REF  21  LAST 1365      43,3623  11'377 1           CCS   SKEEP7
0396  REF   1                 43,3624  0 3530 1           TC    COMADRS
0397  REF   2  LAST 1366      43,3625  0 3530 1           TC    COMADRS
0398  REF   1                 43,3626  0 3554 0           TC    FXADRS
0399  REF   2  LAST 1366      43,3627  0 3554 0           TC    FXADRS

0400  REF   7  LAST 1364      43,3630  4 1374 1  NXTBNK   CS    SKEEP4
0401  REF   1                 43,3631  6 3720 1           AD    LSTBNKCH        LAST BANK TO BE CHECKED
0402                          43,3632  0 0006 1           EXTEND
0403  REF   1                 43,3633  1 3000 0           BZF   ENDSUMS         END OF SUMMING OF BANKS.
0404  REF   8  LAST 1366      43,3634  3 1374 0           CA    SKEEP4
0405  REF   2  LAST 1365      43,3635  6 4700 1           AD    SBIT11
0406  REF   9  LAST 1366      43,3636  55'374 1           TS    SKEEP4          37 TO 40 INCRMTS SKEEP4 BY END RND CARRY
0407  REF   1                 43,3637  0 3643 0           TC    CHKSUPR
0408  REF   1                 43,3640  3 4674 0  17TO20   CA    SBIT15
0409  REF  10  LAST 1366      43,3641  27'374 1           ADS   SKEEP4          SET FOR BANK 20
0410  REF   1                 43,3642  0 3657 0           TC    GONXTBNK
0411  REF   8  LAST 1365      43,3643  7 4364 0  CHKSUPR  MASK  HI5
0412                          43,3644  0 0006 1           EXTEND
0413  REF   1                 43,3645  1 3655 0           BZF   NXTSUPR         INCREMENT SUPER BANK
0414  REF   1                 43,3646  6 3235 0  27TO30   AD    S13BITS
0415                          43,3647  0 0006 1           EXTEND
0416                          43,3650  1 3652 1           BZF   +2              BANK SET FOR 30
0417  REF   2  LAST 1366      43,3651  0 3657 0           TC    GONXTBNK
0418  REF   1                 43,3652  3 3233 0           CA    SIXTY           FIRST SUPER BANK
0419  REF  11  LAST 1366      43,3653  27'374 1           ADS   SKEEP4
0420  REF   3  LAST 1366      43,3654  0 3657 0           TC    GONXTBNK
0421  REF   1                 43,3655  6 3234 1  NXTSUPR  AD    SUPRCCN         SET BNK 30 + INCR SUPR BNK AND CANCEL
0422  REF  12  LAST 1366      43,3656  27'374 1           ADS   SKEEP4          ERC BIT OF THE 37 TO 40 ADVANCE.
0423  REF  22  LAST 1366      43,3657  11'377 1  GONXTBNK CCS   SKEEP7
0424  REF   1                 43,3660  0 3522 1           TC    COMMFX
0425  REF   8  LAST 1366      43,3661  3 4712 1           CA    S+1
0426  REF   1                 43,3662  0 3540 0           TC    FXFX
0427  REF   1                 43,3663  3 4704 0           CA    SBIT7           HAS TO BE LARGER THAN NO OF FXSW BANKS.
0428  REF   2  LAST 1366      43,3664  0 3522 1           TC    COMMFX

0429  REF  13  LAST 1366      43,3665  3 1374 0  SOPTION  CA    SKEEP4
0430  REF   9  LAST 1366      43,3666  7 4364 0           MASK  HI5             = BANK BITS
0431  REF   5  LAST  347      43,3667  0 4345 1           TC    LEFT5
```

```
0432   REF 215  LAST 1365   43,3670  54 001 1          TS      L          BANK NUMBER BEFORE SUPER BANK
0433   REF  14  LAST 1366   43,3671  3 1374 C          CA      SKEEP4
0434   REF   1               43,3672  7 4373 C          MASK    S8BITS     = SUPER BANK BITS
0435                         43,3673  0 0006 1          EXTEND
0436   REF   1               43,3674  1 3702 C          BZF     SOPT       BEFORE SUPER BANK
0437   REF  32  LAST 1364   43,3675  54 021 C          TS      SR         SUPER BANK NECESSARY
0438   REF 216  LAST 1367   43,3676  3 0001 C          CA      L
0439   REF  19  LAST 1360   43,3677  7 4716 1          MASK    SEVEN
0440   REF  33  LAST 1367   43,3700  6 0021 1          AD      SR
0441   REF 217  LAST 1367   43,3701  54 001 1          TS      L          BANK NUMBER WITH SUPER BANK
0442   REF   6  LAST 1366   43,3702  3 1376 1  SOPT    CA      SKEEP6     *
0443                         43,3703  0 0006 1          EXTEND             *
0444                         43,3704  1 3706 1          BZF     +2         * ON -0 CONTINUE WITH ROPE CHECK.
0445   REF   1               43,3705  0 2762 C          TC      SDISPLAY   * ON +1 GO TO DISPLAY OF SUM.
0446   REF  18  LAST 1365   43,3706  11'371 1          CCS     SKEEP1     FORCE SUM TO ABSOLUTE VALUE.
04461                        43,3707  0 3711 C          TC      +2
04462                        43,3710  0 3712 C          TC      +2
04463  REF   9  LAST 1366   43,3711  6 4712 1          AD      S+1
04464  REF  19  LAST 1367   43,3712  55'371 1          TS      SKEEP1
0447   REF 218  LAST 1367   43,3713  4 0001 1  BNKCHK  CS      L          = - BANK NUMBER
0448   REF  20  LAST 1367   43,3714  6 1371 C          AD      SKEEP1
0449   REF   2  LAST 1366   43,3715  6 7716 C          AD      S-1
0450   REF   5  LAST 1364   43,3716  0 3270 1          TC      -1CHK      CHECK SUM
0451   REF   2  LAST  256   43,3717  0 3630 1          TC      NXTBNK

0454   REF  22  LAST 1366      0067                    EBANK= NEWJCB
0455                         43,3720  66100 C  LSTBNKCH BBCON*             * CONSTANT, LAST BANK.
```

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P0001 SUBROUTINE TO UPDATE THE PROGRAM NUMBER DISPLAY ON THE DSKY.

```
0002  REF   2 LAST  214 TO  215:     20     20*          COUNT  02/PHASE

0003                              5243                   BLOCK  02
0004  REF   2  LAST  214         4000                   SETLOC FFTAG1
0005                              5243                   BANK

0006  REF 305  LAST 1365         5243  50 002 0 NEWMODEX INDEX  Q              UPDATE MODREG. ENTRY FOR MODE IN FIXED.
0007                              5244  3 0000 1         CAF    0
0008  REF 306  LAST 1368         5245  24 002 0         INCR   Q

0009  REF  15  LAST 1302         5246  55'011 1 NEWMODEA TS     MODREG         ENTRY FOR MODE IN A.
0014                              5247  3 5252 1 MMDSPLAY CAF    +3             DISPLAY MAJOR MODE.
0015  REF  31  LAST 1283         5250  22 006 1 PREBJUMP LXCH   BBANK          PUTS BBANK IN L
0016  REF   8  LAST 1295         5251  1 4577 1         TCF    BANKJUMP       PUTS Q INTO A
0017  REF   1                    5252   20344 0         CADR   SETUPDSP
```

R0018 RETURN TO CALLER +3 IF MODE = THAT AT CALLER +1. OTHERWISE RETURN TO CALLER +2.

```
0020  REF 307  LAST 1368         5253  50 002 0 CHECKMM  INDEX  Q
0021                              5254  4 0000 0         CS     0
0022  REF  16  LAST 1368         5255  6 1011 0         AD     MODREG
0023                              5256  0 0006 1         EXTEND
0024  REF   2  LAST 1177         5257  1 6710 0         BZF    Q+2
0025  REF   3  LAST  243         5260  1 6706 1         TCF    Q+1            NO MATCH

0026  REF   3  LAST 1368          6711           TCQ     =      Q+2 +1

0027                           14,3751                   BANK   14
0028  REF   1                  10,2000                   SETLOC PHASETAB
0029                           10,2344                   BANK

0030  REF   1                                            COUNT  10/PHASE

0031                           10,2344  0 0004 0 SETUPDSP INHINT
0032  REF  25  LAST  779       10,2345  52 071 0         DXCH   RUPTREG1        SAVE CALLER-S RETURN 2CADR
0033  REF  15  LAST 1171       10,2346  3 4371 0         CAF    PRIO30            EITHER A TASK OR JOB CAN COME TO
0034  REF  31  LAST 1192       10,2347  0 5027 1         TC     NOVAC             NEWMODEX
0035  REF  17  LAST 1368          1011                   EBANK= MODREG
0036  REF   1                  10,2350   03435 0         2CADR  DSPMMJOB
0036  REF   1                  10,2351   60102 1
0037  REF  26  LAST 1368       10,2352  52 071 0         DXCH   RUPTREG1
0038                           10,2353  0 0003 1         RELINT
0039  REF  16  LAST  780       10,2354  52 006 0         DXCH   Z               RETURN

0040  REF   2  LAST  367       40,3435           DSPMMJOB EQUALS DSPMMJB

0041                              5261                   BLOCK  02
```

```
0042   REF   3  LAST 1366      4000                    SETLOC FFTAG1
0043                            5261                    BANK
```

P0044 PHASCHNG IS THE MAIN WAY OF MAKING PHASE CHANGES FOR RESTARTS. THERE ARE THREE FORMS OF PHASCHNG, KNOWN AS TYPE
R0046 A, TYPE B, AND TYPE C. THEY ARE ALL CALLED AS FOLLOWS, WHERE OCT XXXXX CONTAINS THE PHASE INFORMATION,

```
A0048                                   TC      PHASCHNG
A0049                                   OCT     XXXXX
```

R0050 TYPE A IS CONCERNED WITH FIXED PHASE CHANGES, THAT IS, PHASE INFORMATIONTHAT IS STORED PERMANENTLY. THESE
R0052 OPTIONS ARE, WHERE G STANDS FOR A GROUP AND .X FOR THE PHASE,

```
R0053                   G.0             INACTIVE, WILLNOT PERMIT A GROUP G RESTART
R0055                   G.1             WILL CAUSE THE LAST DISPLAY TO BE REACTIVATED, USED MAINLY IN MANNED FLIGHTS
R0057                   G.EVEN          A DOUBLE TABLE RESTART, CAN CAUSE ANY COMBINATION OF TWO JOBS, TASKS, AND/OR
R0059                                   LONGCALL TO BE RESTARTED.
R0060                   G.ODD NOT .1    A SINGLE TABLE RESTART, CAN CAUSE EITHER A JOB, TASK, OR LONGCALL RESTART
```

R0062 THIS INFORMATION IS PUT INTO THE OCTAL WORD AFTER TC PHASCHNG AS FOLLOWS

```
R0063                   TLG OOP PPP PPP GGG
```

R0065 WHERE EACH LETTER OR NUMBER STANDS FOR A BIT. THE G:S STAND FOR THE GROUP, OCTAL 1 - 7, THE P:S FOR THE PHASE,
R0067 OCTAL 0 - 127. O:S MUST BE 0. IF ONE WISHES TO HAVE THE TBASE OF GROUP G TO BE SET AT THIS TIME,
R0069 T IS SET TO 1, OTHERWISE IT IS SET TO 0. SIMIARLY IF ONE WISHES TO SET LONGBASE, THEN L IS SET TO 1, OTHERWISE
R0071 IT IS SET TO 0. SOME EXAMPLES,

```
A0072                                   TC      PHASCHNG        THIS WILL CAUSE GROUP 3 TOBE SET TO 0,
A0073                                   OCT     00003           MAKING GROUP 3 INACTIVE

A0074                                   TC      PHASCHNG        IF A RESTART OCCURS THIS WOULD CAUSE
A0075                                   OCT     00012           GROUP 2 TO RESTART THE LAST DISPLAY

A0076                                   TC      PHASCHNG        THIS SETS THE TBASE OF GROUP 4 AND IN
A0077                                   OCT     40064           CASE OF A RESTART WOULD START UP THE TWO
A0078                                                           THINGS LOCATED IN THE DOUBLE 4.6 RESTART
A0079                                                           LOCATION
A0080                                   TC      PHASCHNG        THIS SETS LONGBASE AND UPON A RESTART
A0081                                   OCT     20135           CAUSES 5.13 TO BE RESTARTED (SINCE
A0082                                                           LONGBASE WAS SET THIS SINGLE ENTRY
A0083                                                           SHOULD BE A LONGCALL)
A0084                                   TC      PHASCHNG        SINCE BOTH TBASE4 AND LONGBASE ARE SET,
A0085                                   OCT     60124           4.12 SHOULD CONTAIN BOTH A TASK AND A
A0086                                                           LONGCALL TO BE RESTARTED
```

R0087 TYPE C PHASCHNG CONTAINS THE VARIABLE TYPE OF PHASCHNG INFORMATION. INSTEAD OF THE INFORMATION BEING IN A
R0089 PERMANENT FORM, ONE STORES THE DESIRED RESTART INFORMATION IN A VARIABKE LOCATION. THE BITS ARE AS FOLLOWS,

```
R0091                   TLG IAO XXX CJW GGG
```

R0092 WHERE EACH LETTER OR NUMBER STANDS FOR A BIT. THE G:S STAND FOR THE GROUP, OCTAL 1 - 7. IF THE RESTART IS TO
R0094 BE BY WAITLIST, W IS SET TO 1, IF IT IS A JOB, J IS SET TO 1, IF IT IS A LONGCALL, C IS SET TO 1. ONLY ONE OF
R0096 THESE THREE BIT S MAY BE SET. X:S ARE IGNORED I MUST BE 1, AND O MUST BE 0. AGAIN T STANDS FOR THE TBASE,

R0098 AND L FOR LONGBASE. THE BITS A AND D ARE CONCERNED WITH THE VARIABLE INFORMATION. IF D IS SET TO 1, A PRIORITY
R0100 OR DELTA TIME WILL BE READ FROM THE NEXT LOCATION AFTER THE OCTAL INFORMATION, IF THIS IS TO BE INDIRECT, THAT
R0102 IS, THE NAME OF A LOCATION CONTAINING THE INFORMATION (DELTA TIME ONLY), THEN THIS IS GIVEN AS THE -GENADR OF
R0104 THAT LOCATION WHICH CONTAINS THE DELTA TIME. IF THE OLD PRIORITY OR DELTA TIME IS TO BE USED, THAT WHICH IS
R0106 ALREADY IN THE VARIABLE STORAGE, THEN D IS SET TO 0. NEXT THE A BIT IS USED. IF IT IS SET TO 0, THE ADDRESS
R0108 THAT WOULD BE RESTARTED DURING A RESTART IS THE NEXT LOCATION AFTER THE PHASE INFORMATION, THAT IS, EITHER
R0110 (TC PHASCHNG) +2 OR +3, DEPENDING ON WHETHER D HAD BEEN SET OR NOT. IF A IS SET TO 1, THEN THE ADDRESS THAT
R0112 WOULD BE RESTARTED IS THE 2CADR THAT IS READ FROM THE NEXT TWO LOCATIONS. EXAMPLES,

```
A0114                   AD      TC      PHASCHNG        THIS WOULD CAUSE LOCATION AD +3 TO BE
A0115                   AD+1    OCT     05023           RESTARTED BY GROUP THREE WITHA PRIORITY
A0116                   AD+2    OCT     23000           OF 23.  NOTE UPON RETURNING IT WOULD
A0117                   AD+3                            ALSO GO TO AD+3

A0118                   AD      TC      PHASCHNG        GROUP  1 WOULD CAUSE CAUSE CALLCALL TO
A0119                   AD+1    OCT     27441           BE STARTED AS A LONGCALL FROM THE TIME
A0120                   AD+2    -GENADR DELTIME         STORED IN LONGBASE (LONGBASE WAS SET) BY
A0121                   AD+3     2CADR  CALLCALL        A DELTATIME STORED IN DELTIME.  THE
A0122                   AD+4                            B8CON OF THE 2CADR SHOULD CONTAIN THE E
A0123                   AD+5                            BANK OF DELTIME. PHASCHNG RETURNS TO
A0124                                                   LOCATION AD+5
```

R0125 NOTE THAT IF A VARIABLE PRIORITY IS GIVEN FOR A JOB, THE JOB WILL BE RESTARTED AS A NOVAC IF THE PRIORITY IS
R0127 NEGATIVE, AS A FINDVAC IF THE PRIORITY IS POSITIVE.

R0128 TYPE E PHASCHNG IS A COMBINATION OF VARIABLE AND FIXED PHASE CHANGES. IT WILL START UP A JOB AS INDICATED
R0130 BELOW AND ALSO START UP ONE FIXED RESTART, THAT IS EITHER AN G.1 OR A G.ODD OR THE FIRST ENTRY OF G.EVEN
R0132 OCTBLE ENTRY. THE BIT INFORMATION IS AS FOLLOWS,

R0133 TL1 DAP PPP PPP GGG

R0134 WHERE EACH LETTER OR NUMBER STANDS FOR A BIT. THE G:S STAND FOR THE GROUP, OCTAL 1 - 7. THE P:S FOR THE FIXED
R0136 PHASE INFORMATION, OCTAL 0 - 127. 1 MUST BE 1. AND AGAIN T STANDS FOR THE TBASE AND L FOR LONGBASE. D THIS
R0138 TIME STANDS ONLY FOR PRIORITY SINCE THIS WILL BE CONSIDERED A JOB, AND IT MUST BE GIVEN DIRECTLY IF GIVEN.
R0140 AGAIN A STANDS FOR THE ADDRESS OF THE LOCATION TO BE RESTARTED, 1 IF THE 2CADR IS GIVEN , OR 0 IF IT IS TO BE
R0142 THE NEXT LOCATION.(THE RETURN LOCATION OF PHASCHNG) EXAMPLES,

```
A0143                   AD      TC      PHASCHNG        TBASE IS SET AND ARESTART CAUSE GROUP 3
A0144                   AD+1    OCT     56043           TO START THE JOB AJOBAJOB WITH PRIORITY
A0145                   AD+2    OCT     31000           31 AND THE FIRST ENTRY OF 3.4SPOT(WE CAN
A0146                   AD+3    2CADR   AJOBAJOB        ASSUME IT IS A TASK SINCE WE SET TBASE3)
A0147                   AD+4                            UPON RETURN FROM PHASCHNG CONTROL WOULD
A0148                   AD+5                            GO TO AD+5

A0149                   AD      TC      PHASCHNG        UPON A RESTART THE LAST DISPLAY WOULD BE
A0150                   AD+1    OCT     10015           RESTARTED AND A JOB WITH THE PREVIOUSLY
A0151                   AD+2                            STORED PRIORITY WOULD BE BEGUN AT AD+2
A0152                                                   BY MEANS OF GROUP 5
```

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R0153 THE NOVAC-FINDVAC CHOICE FOR JOBS HOLDS HERE ALSO - NEGATIVE PRIORITY CAUSES A NOVAC CALL, POSITIVE A FINDVAC.

R0155 SUMMARY OF BITS

R0156 TYPE A TLO OOP PPP PPP GGG

R0157 TYPE B TL1 DAP PPP PPP GGG

R0158 TYPE C TLC 1AD XXX CJW GGG

```
P0159  2PHSCHNG IS USED WHEN ONE WISHES TO START UP A GROUP OR CHANGE A GROUP WHILE UNDER THE CONTROL OF A DIFFERENT
R0161  GROUP. FOR EXAMPLE, CHANGE THE PHASE OF GROUP 3 WHILE THE PORTION OF THE PROGRAM IS UNDER GROUP 5. ALL 2PHSCHNG
R0163  CALLS ARE MADE IN THE FOLLOWING MANNER,

A0164                                          TC      2PHSCHNG
A0165                                          OCT     XXXXX
A0166                                          OCT     YYYYY

R0167  WHERE OCT XXXXX MUST BE OF TYPE A AND OCT YYYYY MAY BE OF EITHER TYPE A OR TYPE B OR TYPEC.  THERE IS ONE
R0169  DIFFERENCE --- NOTE- IF LONGBASE IS TO BE SET THIS INFORMATION IS GIVEN IN THE OCT YYYYY INFORMATION, IT WILL
R0171  BE DISREGARDED IF GIVEN WITH THE OCT XXXXX INFORMATION. A COUPLE OF EXAMPLES MAY HELP,

A0173                                  AD      TC      2PHSCHNG        SET TBASE3 AND IF A RESTART OCCURS START
A0174                                  AD+1    OCT     40083           THE TWO ENTRIES IN 3.8 TABLE LOCATION
A0175                                  AD+2    OCT     05025           THIS IS OF TYPE C, SET THE JOB TO BE
A0176                                  AD+3    OCT     1800C           TO BE LOCATION AD+4, WITH A PRIORITY 18,
A0177                                  AD+4                            FOR GROUP 5 PHASE INFORMATION

 0178  REF   3 LAST 1368 TO 1368:    14    34*          COUNT   02/PHASE

 0179                        5261  0 0004 C  2PHSCHNG INHINT
 0180  REF 308  LAST 1368    5262  50 002 C            NDX     Q
 0181                        5263  3 0000 1            CA      0
 0182  REF 309  LAST 1373    5264  24 002 C            INCR    Q
 0183  REF   1               5265  54 072 C            TS      TEMPP2

 0184  REF   1               5266  7 4716 1            MASK    OCT7
 0185                        5267  6 0000 1            DOUBLE
 0186  REF   1               5270  54 071 C            TS      TEMPG2

 0187  REF   2  LAST 1373    5271  3 0072 1            CA      TEMPP2
 0188  REF   1               5272  7 4765 C            MASK    OCT17770        NEED ONLY 1770, BUT WHY GET A NEW CONST.
 0189                        5273  0 0006 1            EXTEND
 0190  REF  32  LAST 1359    5274  7 4677 1            MP      BIT12
 0191  REF   3  LAST 1373    5275  56 072 1            XCH     TEMPP2

 0192  REF  50  LAST 1359    5276  7 4674 1            MASK    BIT15
 0193  REF   1               5277  54 066 C            TS      TEMPSW2         INDICATES WHETHER TO SET TBASE OR NOT

 0194  REF 101  LAST 1313    5300  1 5304 1            TCF     PHASCHNG +3


 0195                        5301  0 0004 C  PHASCHNG INHINT
 0196  REF 157  LAST 1334    5302  3 4712 1            CA      ONE             INDICATESWE CAME FROM A PHASCHNG ENTRY
 0197  REF   2  LAST 1373    5303  54 066 C            TS      TEMPSW2

 0198  REF 310  LAST 1373    5304  50 002 C            NDX     Q
 0199                        5305  3 0000 1            CA      0
 0200  REF 311  LAST 1373    5306  24 002 C            INCR    Q
 0201  REF   1               5307  54 065 C            TS      TEMPSW
```

```
0202                                5310  0 0006 1            EXTEND
0203  REF   1                      5311  3 5314 1            DCA     ADRPCHN2        OFF TO SWITCHED BANK
0204                                5312  52 006 C            DTCB

0205  REF  47  LAST 136C  E3,1400                             EBANK=  LST1
0206  REF   1                      5313   02355 C  ADRPCHN2 2CADR  PHSCHNG2
0206  REF   1                      5314   20103 1

0207  REF   1                      5315  22 073 C  CNECRTWO LXCH    TEMPBBCN
0208  REF  32  LAST 136E           5316  22 006 1            LXCH    BBANK
0209  REF   2  LAST 1374           5317  22 073 C            LXCH    TEMPBBCN

0210  REF   1                      5320  7 4761 1            MASK    OCT14000        SEE WHAT KIND OF PHASE CHANGE IT IS
0211  REF 347  LAST 1369           5321  10 000 C            CCS     A
0212  REF   1                      5322  1 5363 C            TCF     CHECKB          IT IS OF TYPE :B:

0213  REF   1                      5323  3 0062 C            CA      TEMPP
0214  REF  92  LAST 1359           5324  7 4704 1            MASK    BIT7
0215  REF 348  LAST 1374           5325  10 000 C            CCS     A               SHALL WE USE THE OLD PRIORITY
0216  REF   1                      5326  1 5350 C            TCF     GETPRIO         NO GET A NEW PRIORITY (OR DELTA T)

0217  REF   4  LAST  214           5327  50 061 C  CLOPRIO   NDX     TEMPC           USE THE OLD PRIORITY (OR DELTA T)
0218  REF   1                      5330  3 1052 1            CA      PHSPRDT1 -2
0219  REF   1                      5331  54 070 1            TS      TEMPPR

0220  REF   2  LAST 1374           5332  3 0062 C  CON1      CA      TEMPP           SEE IF A 2CADR IS GIVEN
0221  REF  29  LAST 1359           5333  7 4703 C            MASK    BIT8
0222  REF 349  LAST 1374           5334  10 000 C            CCS     A
0223  REF   1                      5335  1 5354 1            TCF     GETNEWNM

0224  REF 312  LAST 1373           5336  3 0002 C            CA      Q
0225  REF   1                      5337  54 063 C            TS      TEMPNM
0226  REF   1                      5340  3 0006 1            CA      BB
0227                                5341  0 0006 1            EXTEND                  PICK UP USERS SUPERBANK
0228  REF  23  LAST 1199           5342  04 007 1            ROR     SUPERBNK
0229  REF   1                      5343  54 064 1            TS      TEMPBB

0230  REF   1                      5344  3 5347 1  TOCON2    CA      CON2ADR         BACK TO SWITCHED BANK
0231  REF   3  LAST 1374           5345  22 073 C            LXCH    TEMPBBCN
0232                                5346  52 006 C            DTCB

0233  REF   1                      5347   02443 C  CON2ADR   GENADR  CON2

0234  REF 313  LAST 1374           5350  50 002 C  GETPRIO   NDX     Q               DON:T CARE IF DIRECT OR INDIRECT
0235                                5351  3 0000 1            CA      0               LEAVE THAT DECISION TO RESTARTS
0236  REF 314  LAST 1374           5352  24 002 C            INCR    Q               OBTAIN RETURN ADDRESS
0237  REF   1                      5353  1 5331 1            TCF     CON1 -1

0238                                5354  0 0006 1  GETNEWNM EXTEND
```

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```
0239   REF 315  LAST 1374      5355  5 0002 C            INDEX  Q
0240                           5356  3 0001 C            DCA    0
0241   REF   2  LAST 1374      5357  52 064 1            DXCH   TEMPNM
0242   REF  68  LAST 1291      5360  3 4711 1            CA     TWO
0243   REF 316  LAST 1375      5361  26 002 1            ADS    Q              OBTAIN RETURN ADDRESS

0244   REF   1                 5362  1 5344 C            TCF    TOCOM2

0245   REF   6  LAST  662      4761            OCT14000 EQUALS PRIO14
0246   REF  13  LAST 1331      0061            TEMPG    EQUALS ITEMP1
0247   REF  16  LAST 1331      0062            TEMPP    EQUALS ITEMP2
0248   REF   4  LAST   65      0063            TEMPNM   EQUALS ITEMP3
0249   REF   3  LAST   65      0064            TEMPBB   EQUALS ITEMP4
0250   REF   2  LAST   65      0065            TEMPSW   EQUALS ITEMP5
0251   REF   3  LAST  153      0066            TEMPSW2  EQUALS ITEMP6
0252   REF  27  LAST 1368      0070            TEMPPR   EQUALS RUPTREG1
0253   REF   6  LAST  144      0071            TEMPG2   EQUALS RUPTREG2
0254   REF   5  LAST 1072      0072            TEMPP2   EQUALS RUPTREG3

0255   REF   5  LAST 1072      0073            TEMPBBCN EQUALS RUPTREG4
0256   REF  33  LAST 1374      0006            BB       EQUALS BBANK


0257                        14,3751                      BANK   14
0258   REF   2  LAST 1368   10,2000                      SETLOC PHASETAB
0259                        10,2355                      BANK

0260   REF   1              E3,1436                      EBANK= PHSNAME1
0261   REF   2 LAST 1368 TO 1373:    9     9*           COUNT  10/PHASE

0262   REF   4  LAST 1374   10,2355  22 073 C  PHSCHNG2 LXCH   TEMPBBCN
0263   REF   2  LAST 1373   10,2356  3 0065 1            CA     TEMPSW
0264   REF   2  LAST 1373   10,2357  7 4716 1            MASK   OCT7
0265                        10,2360  6 0000 1            DOUBLE
0266   REF   5  LAST 1374   10,2361  54 061 1            TS     TEMPG

0267   REF   3  LAST 1375   10,2362  3 0065 1            CA     TEMPSW
0268   REF   2  LAST 1373   10,2363  7 4765 C            MASK   OCT17770
0269                        10,2364  0 0006 1            EXTEND
0270   REF  33  LAST 1373   10,2365  7 4677 1            MP     BIT12
0271   REF   3  LAST 1374   10,2366  54 062 1            TS     TEMPP

0272   REF   4  LAST 1375   10,2367  3 0065 1            CA     TEMPSW
0273   REF  13  LAST  901   10,2370  7 4105 C            MASK   OCT60000
0274   REF   5  LAST 1375   10,2371  56 065 1            XCH    TEMPSW
0275   REF   2  LAST 1374   10,2372  7 4761 1            MASK   OCT14000
0276   REF 350  LAST 1374   10,2373  10 000 C            CCS    A

0277   REF   1              10,2374  1 5315 1            TCF    ONEORTWO
```

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```
0278  REF   4  LAST 1375   10,2375  3 0062 C          CA    TEMPP      START STORING THE PHASE INFORMATION
0279  REF   6  LAST 1375   10,2376  50 061 C          NDX   TEMPC
0280  REF   2  LAST  183   10,2377  54 751 C          TS    PHASE1 -2

0281  REF   3  LAST 1373   10,2400  10 066 C  BELOW1   CCS   TEMPSW2     IS IT A PHASCHNG OR A 2PHSCHNG
0282  REF   1               10,2401  1 2415 1          TCF   BELOW2     IT:S A PHASCHNG

0283                        10,2402  1 2403 C          TCF   +1         IT:S A 2PHSCHNG
0284  REF   4  LAST 1373   10,2403  4 0072 C          CS    TEMPP2
0285  REF   5  LAST 1376   10,2404  22 072 1          LXCH  TEMPP2
0286  REF   2  LAST 1373   10,2405  50 071 1          NDX   TEMPC2
0287  REF   5  LAST  214   10,2406  52 751 C          DXCH  -PHASE1 -2

0288  REF   4  LAST 1376   10,2407  10 066 C          CCS   TEMPSW2
0289                        10,2410  12 411 C          NOOP             CAN:T GET HERE
0290  REF   2  LAST 1376   10,2411  1 2415 1          TCF   BELOW2

0291  REF  19  LAST 1068   10,2412  4 0025 1          CS    TIME1
0292  REF   3  LAST 1376   10,2413  50 071 1          NDX   TEMPC2
0293  REF   4  LAST  383   10,2414  55*051 C          TS    TBASE1 -2

0294  REF   6  LAST 1375   10,2415  10 065 C  BELOW2   CCS   TEMPSW     SEE IF WE SHOULD SET TBASE OR LONGBASE
0295  REF   1               10,2416  1 2431 1          TCF   BELOW3     SET LONGBASE ONLY
0296  REF   1               10,2417  1 2434 1          TCF   BELOW4     SET NEITHER

0297  REF  20  LAST 1376   10,2420  4 0025 1          CS    TIME1      SET TBASE TO BEGIN WITH
0298  REF   7  LAST 1376   10,2421  50 061 C          NDX   TEMPC
0299  REF   5  LAST 1376   10,2422  55*051 C          TS    TBASE1 -2

0300  REF   7  LAST 1376   10,2423  3 0065 1          CA    TEMPSW      SHALL WE NOW SET LONGBASE
0301  REF   1               10,2424  6 2427 1          AD    BIT14COM
0302  REF 351  LAST 1375   10,2425  10 000 C          CCS   A
0303                        10,2426  12 427 C          NOOP             ***** CANT GET HERE *****
0304                        10,2427   17777 C  BIT14COM OCT   17777     ***** CANT GET HERE *****
0305  REF   2  LAST 1376   10,2430  1 2434 1          TCF   BELOW4     NO WE NEED ONLY SET TBASE

0306                        10,2431  0 0006 1  BELOW3   EXTEND           SET LONGBASE
0307  REF  29  LAST 1295   10,2432  3 0025 C          DCA   TIME2
0308  REF   1               10,2433  53*136 C          DXCH  LONGBASE

0309  REF   5  LAST 1376   10,2434  4 0062 1  BELOW4   CS    TEMPF      AND STORE THE FINAL PART OF THE PHASE
0310  REF   8  LAST 1376   10,2435  50 061 C          NDX   TEMPC
0311  REF   6  LAST 1376   10,2436  54 750 1          TS    -PHASE1 -2

0312  REF 317  LAST 1375   10,2437  3 0002 0          CA    Q
0313  REF   9  LAST 1375   10,2440  22 073 C          LXCH  TEMPBBCN
0314                        10,2441  0 0003 1          RELINT
0315                        10,2442  52 006 C          DTCB
0316  REF   6  LAST 1376   10,2443  22 073 0  CON2     LXCH  TEMPBBCN
```

L PHASE TABLE MAINTENANCE USER'S PAGE NO. 10 E3 S4

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0317   REF   6  LAST 1376    10,2444  3 0062 C          CA     TEMPP
0318   REF   9  LAST 1376    10,2445  50 061 C          NDX    TEMPG
0319   REF   3  LAST 1376    10,2446  54 751 C          TS     PHASE1 -2

0320   REF   2  LAST 1374    10,2447  3 0070 C          CA     TEMPPR
0321   REF  10  LAST 1377    10,2450  50 061 C          NDX    TEMPG
0322   REF   2  LAST 1374    10,2451  55*052 C          TS     PHSPRDT1 -2

0323                         10,2452  0 0006 1          EXTEND
0324   REF   3  LAST 1375    10,2453  3 0064 C          DCA    TEMPNR
0325   REF  11  LAST 1377    10,2454  50 061 C          NDX    TEMPG
0326   REF   2  LAST 1375    10,2455  53*435 C          DXCH   PHSNAME1 -2

0327   REF   1               10,2456  1 2400 C          TCF    BELOW1

0328                            5363                    BLOCK  02
0329   REF   4  LAST 1369      4000                    SETLOC FFTAG1
0330                            5363                    BANK

0331   REF   4 LAST 1373 TO 1375:    66   100*         COUNT  02/PHASE

0332   REF  34  LAST 1375      5363  7 4677 1  CHECKB   MASK   BIT12      SINCE THIS IS OF TYPE B, THIS BIT SHOULD
0333   REF 352  LAST 1376      5364  10 000 C          CCS    A           BE HERE IF WE ARE TO GET A NEW PRIORITY
0334   REF   2  LAST 1374      5365  1 5350 C          TCF    GETPRIO     IT IS, SO GET NEW PRIORITY

0335   REF   1                 5366  1 5327 C          TCF    OLDPRIO     IT ISN:T, USE THE OLD PRIORITY
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0001                          01,3520                    BANK    01
0002  REF   2  LAST  205     01,2000                    SETLOC  RESTART
0003                          01,3520                    BANK

0004  REF   3  LAST 1377     E3,1436                    EBANK=  PHSNAME1        GOPROG MUST SWITCH TO THIS EBANK

0005  REF   1                                          COUNT   01/RSRCU

0006  REF 669  LAST 1334     01,3520  3 0161 1 RESTARTS CA      MPAC +5         GET GROUP NUMBER -1
0007                          01,3521  6 0000 1          DOUBLE                 SAVE FOR INDEXING
0008  REF   1                 01,3522  54 155 1          TS      TEMP2G

0009  REF   1                 01,3523  3 3762 1          CA      PHS2CADR       SET UP EXIT IN CASE IT IS AN EVEN
0010  REF   1                 01,3524  54 157 0          TS      TEMPSWCH       TABLE PHASE

0011  REF   1                 01,3525  3 3557 0          CA      RTRNCADR       TO SAVE TIME ASSUME IT WILL GET NEXT
0012  REF   1                 01,3526  54 707 0          TS      GOLOC +2       GROUP AFTER THIS

0013  REF   1                 01,3527  3 0154 1          CA      TEMPPHS
0014  REF   9  LAST 1360     01,3530  7 4744 0          MASK    OCT1400
0015  REF 353  LAST 1377     01,3531  10 000 0          CCS     A              IS IT A VARIABLE OR TABLE RESTART
0016  REF   1                 01,3532  1 3543 1          TCF     ITSAVAR        IT:S A VARIABLE RESTART

0017  REF   2  LAST 1378     01,3533  10 154 0 GETPART2 CCS     TEMPPHS        IS IT AN X.1 RESTART
0018  REF 354  LAST 1378     01,3534  10 000 0          CCS     A
0019  REF   1                 01,3535  1 3643 1          TCF     ITSATBL        NO, ITS A TABLE RESTART

0020  REF   7  LAST 1375     01,3536  3 4761 0          CA      PRIO14         IT IS AN X.1 RESTART, THEREFORE START
0021  REF  31  LAST 1279     01,3537  0 5042 1          TC      FINDVAC        THE DISPLAY RESTART JOB
0022  REF  48  LAST 1374     E3,1400                    EBANK=  LST1
0023  REF   1                 01,3540   03165 0          2CADR   INITDSP
0023  REF   1                 01,3541   20103 1

0024  REF   2  LAST 1378     01,3542  0 3557 0          TC      RTRNCADR       FINISHED WITH THIS GROUP, GET NEXT ONE

0025  REF  10  LAST 1378     01,3543  7 4744 0 ITSAVAR  MASK    OCT1400        IS IT TYPE B ?
0026  REF 355  LAST 1378     01,3544  10 000 0          CCS     A
0027  REF   1                 01,3545  1 3614 0          TCF     ITSLIKEB       YES,IT IS TYPE B

0028                          01,3546  0 0006 1          EXTEND                 STORE THE JOB (OR TASK) 2CADR FOR EXIT
0029  REF   2  LAST 1378     01,3547  5 0155 0          NDX     TEMP2G
0030  REF   4  LAST 1378     01,3550  3 1437 0          DCA     PHSNAME1
0031  REF   2  LAST 1378     01,3551  52 706 1          DXCH    GOLOC

0032  REF   3  LAST 1378     01,3552  3 0154 1          CA      TEMPPHS        SEE IF THIS IS A JOB, TASK, OR A LONGCAL
0033  REF   3  LAST 1375     01,3553  7 4716 1          MASK    OCT7
0034  REF   3  LAST 1225     01,3554  6 7715 0          AD      MINUS2
0035  REF 356  LAST 1378     01,3555  10 000 0          CCS     A
0036  REF   1                 01,3556  1 3726 0          TCF     ITSLNGCL       ITS A LONGCALL
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0037   REF   6  LAST  294    01,3557  0 4570 1  RTRNCADR TC    SWRETURN        CANT GET HERE
0038   REF   1               01,3560  1 3562 1           TCF   ITSAWAIT
0039   REF   1               01,3561  1 3627 C           TCF   ITSAJOB         ITS A JOB
0040   REF   1               01,3562  3 3766 C  ITSAWAIT CA    WTLTCADR        SET UP WAITLIST CALL
0041   REF   3  LAST 1378    01,3563  54 704 C           TS    GOLOC -1
0042   REF   3  LAST 1378    01,3564  50 155 C           NDX   TEMP2G          DIRECTLY STORED
0043   REF   3  LAST 1377    01,3565  3 1054 1           CA    PHSPRDT1
0044   REF 357  LAST 1378    01,3566  10 000 C  TIMETEST CCS   A               IS IT AN IMMEDIATE RESTART
0045   REF 358  LAST 1375    01,3567  24 000 1           INCR  A               NO,
0046   REF   1               01,3570  1 3573 1           TCF   FINDTIME        FIND OUT WHEN IT SHOULD BEGIN
0047   REF   1               01,3571  1 5367 1           TCF   ITSINDIR        STORED INDIRECTLY
0048   REF   1               01,3572  1 3612 C           TCF   IMEDIATE        IT WANTS AN IMMEDIATE RESTART
R0049  ***** THIS MUST BE IN FIXED FIXED *****
0050                          5367                      BLOCK 02
0051   REF   2  LAST  620     4000                      SETLOC FFTAG2
0052                          5367                      BANK
0053   REF   1                                          COUNT 02/RSRCU
0054   REF   4  LAST 1375     5367  22 706 C  ITSINDIR LXCH  GOLOC +1         GET THE CORRECT E BANK IN CASE THIS IS
0055   REF   2  LAST 1374     5370  22 006 1           LXCH  BB                SWITCHED ERRASIBLE
0056   REF 359  LAST 1375     5371  50 000 1           NDX   A                 GET THE TIME INDIRECTLY
0057                          5372  3 0001 C           CA    1
0058   REF   3  LAST 1375     5373  22 006 1           LXCH  BB                RESTORE THE BB AND GOLOC
0059   REF   5  LAST 1375     5374  22 706 C           LXCH  GOLOC +1
0060   REF   2  LAST 1375     5375  1 3573 1           TCF   FINDTIME          FIND OUT WHEN IT SHOULD BEGIN
R0061  ***** YOU MAY RETURN TO SWITCHED FIXED *****
0062                        01,3573                     BANK  01
0063   REF   3  LAST 1378    01,2000                     SETLOC RESTART
0064                        01,3573                     BANK
0065   REF   2 LAST 1378 TO 1379:     43     43*       COUNT 01/RSRCU
0066                        01,3573  4 0000 C  FINDTIME COM
0067   REF 219  LAST 1367   01,3574  54 001 1           TS    L                 AND SAVE
0068   REF   4  LAST 1375   01,3575  50 155 C           NDX   TEMP2G
0069   REF   6  LAST 1376   01,3576  4 1053 1           CS    TBASE1
0070                        01,3577  0 0006 1           EXTEND
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0071   REF  21  LAST 1376   01,3600  60 025 C            SU      TIME1
0072   REF 360  LAST 1379   01,3601  10 000 C            CCS     A
0073                        01,3602   4 0000 C            COM
0074   REF   4  LAST  915   01,3603   6 7700 1            AD      OCT37776
0075   REF 158  LAST 1373   01,3604   6 4712 1            AD      ONE
0076   REF 220  LAST 1379   01,3605   6 0001 C            AD      L
0077   REF 361  LAST 1380   01,3606  10 000 C            CCS     A
0078   REF 249  LAST 1359   01,3607   3 4714 1            CA      ZERO
0079                        01,3610   1 3612 C            TCF     +2
0080                        01,3611   1 3612 C            TCF     +1
0081   REF 159  LAST 1380   01,3612   6 4712 1  IMEDIATE  AD      ONE
0082   REF   6  LAST 1379   01,3613   0 0704 1            TC      GOLOC -1
0083   REF   3  LAST 1376   01,3614   3 3557 C  ITSLIKEB  CA      RTRNCADR        TYPE B,                 SO STORE RETURN IN
0084   REF   2  LAST 1378   01,3615  54 157 C            TS      TEMPSWCH        TEMPSWCH IN CASE OF AN EVEN PHASE

0085   REF   1              01,3616   3 3763 C            CA      PRT2CADR        SET UP EXIT TO GET TABLE PART OF THIS
0086   REF   7  LAST 1380   01,3617  54 707 C            TS      GOLOC +2        VARIABLE TYPE OF PHASE

0087   REF   4  LAST 1378   01,3620   3 0154 1            CA      TEMPPHS         MAKE THE PHASE LOOK RIGHT FOR THE TABLE
0088   REF   1              01,3621   7 6043 1            MASK    OCT177          PART OF THIS VARIABLE PHASE
0089   REF   5  LAST 1380   01,3622  54 154 C            TS      TEMPPHS

0090                        01,3623   0 0006 1            EXTEND
0091   REF   5  LAST 1379   01,3624   5 0155 C            NDX     TEMP2C          OBTAIN THE JOB:S 2CADR
0092   REF   5  LAST 1378   01,3625   3 1437 C            DCA     PHSNAME1
0093   REF   8  LAST 1380   01,3626  52 706 1            DXCH    GOLOC

0094   REF   6  LAST 1380   01,3627  50 155 C  ITSAJOB    NDX     TEMP2C          NOW ADD THE PRIORITY AND LET:S GO
0095   REF   4  LAST 1379   01,3630   3 1054 1            CA      PHSPRDT1
0096   REF   9  LAST 1380   01,3631  54 704 C  CHKNOVAC   TS      GOLOC -1        SAVE PRIO UNTIL WE SEE IF ITS
0097                        01,3632   0 0006 1            EXTEND                  A FINDVAC OR A NOVAC
0098   REF   1              01,3633   6 3637 C            BZMF    ITSNOVAC

0099   REF   1              01,3634   3 3765 C            CAF     FVACCADR        POSITIVE, SET UP FINDVAC CALL.
0100   REF  10  LAST 1380   01,3635  56 704 1            XCH     GOLOC -1        PICK UP PRIO,
0101   REF  11  LAST 1380   01,3636   0 0704 1            TC      GOLOC -1        AND GO

0102   REF   1              01,3637   3 3767 1  ITSNOVAC  CAF     NOVACADR        NEGATIVE,
0103   REF  12  LAST 1380   01,3640  56 704 1            XCH     GOLOC -1        SET UP NOVAC CALL,
0104                        01,3641   4 0000 C            COM                     CORRECT PRIO,
0105   REF  13  LAST 1380   01,3642   0 0704 1            TC      GOLOC -1        AND GO

0106   REF  45  LAST 1364   01,3643  54 020 1  ITSATBL    TS      CYR             FIND OUT IF THE PHASE IS ODD OR EVEN
0107   REF  46  LAST 1380   01,3644  10 020 1            CCS     CYR
0108                        01,3645   1 3646 1            TCF     +1              IT:S EVEN
0109   REF   1              01,3646   1 3744 1            TCF     ITSEVEN

0110   REF   4  LAST 1380   01,3647   3 3557 C            CA      RTRNCADR        IN CASE THIS IS THE SECOND PART OF A
0111   REF  14  LAST 1380   01,3650  54 707 C            TS      GOLOC +2        TYPE B RESTART, WE NEED PROPER EXIT
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0112  REF   6  LAST 138C  01,3651  3 0154 1          CA    TEMPPHS     SET UP POINTER FOR FINDING OUR PLACE IN
0113  REF  34  LAST 1367  01,3652  54 021 C          TS    SR          THE RESTART TABLES
0114  REF  35  LAST 1381  01,3653  6 0021 1          AD    SR
0115  REF   7  LAST 138C  01,3654  50 155 C          NDX   TEMP2G
0116  REF   1              01,3655  6 2001 1          AD    SIZETAB +1
0117  REF   1              01,3656  54 156 1          TS    POINTER

0118                       01,3657  0 0006 1  CONTBL2  EXTEND              FIND OUT WHAT:S IN THE TABLE
0119  REF   2  LAST 1381  01,3660  5 0156 C          NDX   POINTER
0120  REF   1              01,3661  3 2002 1          DCA   CADRTAB       GET THE 2CADR

0121  REF  15  LAST 138C  01,3662  22 706 C          LXCH  GOLOC +1      STORE THE BB INFORMATION

0122  REF 362  LAST 138C  01,3663  10 000 C          CCS   A             IS IT A JOB OR IS IT  TIMED
0123  REF 363  LAST 1381  01,3664  24 000 1          INCR  A             POSITIVE, MUST BE A JOB
0124  REF   1              01,3665  1 3740 C          TCF   ITSAJOB2

0125  REF 364  LAST 1381  01,3666  24 000 1          INCR  A             MUST BE EITHER A WAITLIST OR LONGCALL
0126  REF  16  LAST 1381  01,3667  54 705 1          TS    GOLOC         LET-S STORE THE CORRECT CADR

0127  REF   2  LAST 1379  01,3670  3 3766 C          CA    WTLTCADR      SET UP OUR EXIT TO WAITLIST
0128  REF  17  LAST 1381  01,3671  54 704 C          TS    GOLOC -1

0129  REF  18  LAST 1381  01,3672  3 0706 C          CA    GOLOC +1      NOW FIND OUT IF IT IS A WAITLIST CALL
0130  REF  39  LAST 1359  01,3673  7 4701 1          MASK  BIT10         THIS SHOULD BE ONE IF WE HAVE -BB
0131  REF 365  LAST 1381  01,3674  10 000 C          CCS   A             FOR THAT MATTER SO SHOULD BE BITS 9,8,7,
A0132                                                                   6,5, AND LAST BUT NOT LEAST (PERHAPS NOT
A0133                                                                   IN IMPORTANCE ANYWAY. BIT 4
0134  REF   1              01,3675  1 3733 1          TCF   ITSWTLST      IT IS A WAITLIST CALL

0135  REF   3  LAST 1381  01,3676  50 156 C          NDX   POINTER       OBTAIN THE ORIGINAL DELTA T
0136  REF   1              01,3677  3 2000 C          CA    PRDTTAB       ADDRESS FOR THIS LONGCALL

0137  REF   1              01,3700  1 5376 1          TCF   ITSLGCL1      NOW GO GET THE DELTA TIME

R0138  ***** THIS MUST BE IN FIXED FIXED *****

0139                       5376                      BLOCK 02
0140  REF   3  LAST 1379  4000                      SETLOC FFTAG2
0141                       5376                      BANK

0142  REF   2 LAST 1379 TO 1379:    7     7*        COUNT 02/RSROU

0143  REF  19  LAST 1381  5376  22 706 C  ITSLGCL1  LXCH  GOLOC +1      OBTAIN THE CORRECT E BANK
0144  REF   4  LAST 1379  5377  22 006 1            LXCH  BB
0145  REF  20  LAST 1381  5400  22 706 C            LXCH  GOLOC +1      AND PRESERVE OUR E AND F BANKS

0146                       5401  0 0006 1            EXTEND              GET THE DELTA TIME
0147  REF 366  LAST 1381  5402  5 0000 1            NDX   A
0148                       5403  3 0001 C            DCA   0
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0149   REF  21  LAST 1381      5404  22 706 C          LXCH   GOLOC +1        RESTORE OUR E AND F BANK
0150   REF   5  LAST 1381      5405  22 006 1          LXCH   BB              RESTORE THE TASKS E AND F BANKS
0151   REF  22  LAST 1382      5406  22 706 C          LXCH   GOLOC +1        AND PRESERVE OUR L

0152   REF   1                 5407  1 3701 C          TCF    ITSLGCL2        NOW LET:S PROCESS THIS LONGCALL

R0153  ***** YCL  MAY RETURN TO  SWITCHED FIXED *****

0154                    01,3701                         BANK   01
0155   REF   4  LAST 1379      01,2000                 SETLOC RESTART
0156                    01,3701                         BANK

0157   REF   3 LAST 1379 TO 1381:     7C   113*        COUNT  01/RSRCU

0158   REF   6  LAST 1201      01,3701  53'140 1 ITSLGCL2 DXCH   LONGTIME

0159                    01,3702  0 0006 1               EXTEND                 CALCULATE TIME LEFT
0160   REF  30  LAST 1376      01,3703  4 0025 1        DCS    TIME2
0161   REF   7  LAST 1382      01,3704  21'140 1        DAS    LONGTIME
0162                    01,3705  0 0006 1               EXTEND
0163   REF   2  LAST 1376      01,3706  3 1136 1        DCA    LONGBASE
0164   REF   8  LAST 1382      01,3707  21'140 1        DAS    LONGTIME

0165   REF   9  LAST 1382      01,3710  11'137 1        CCS    LONGTIME        FIND OUT HOW THIS SHOULD BE RESTARTED
0166   REF   1                 01,3711  1 3721 1        TCF    LONGCLCL
0167                    01,3712  1 3714 1               TCF    +2
0168   REF   2  LAST 1379      01,3713  1 3607 1        TCF    IMEDIATE -3
0169   REF  10  LAST 1382      01,3714  11'140 1        CCS    LONGTIME +1
0170   REF   2  LAST 1382      01,3715  1 3721 1        TCF    LONGCLCL
0171                    01,3716  13 717 1               NOOP                   CAN:T GET HERE    *********
0172   REF   3  LAST 1382      01,3717  1 3607 1        TCF    IMEDIATE -3
0173   REF   4  LAST 1382      01,3720  1 3612 C        TCF    IMEDIATE

0174   REF   1                 01,3721  3 3764 1 LONGCLCL CA    LCCLCADR        WE WILL GO TO LONGCALL
0175   REF  23  LAST 1382      01,3722  54 704 C        TS     GOLOC -1

0176                    01,3723  0 0006 1               EXTEND                 PREPARE OUR ENTRY TO LONGCALL
0177   REF  11  LAST 1382      01,3724  3 1140 C        DCA    LONGTIME
0178   REF  24  LAST 1382      01,3725  0 0704 1        TC     GOLOC -1

0179   REF   3  LAST 1381      01,3726  3 3766 C ITSLNGCL CA    WTLTCADR        ASSUME IT WILL GO TO WAITLIST
0180   REF  25  LAST 1382      01,3727  54 704 C        TS     GOLOC -1

0181   REF   8  LAST 1381      01,3730  50 155 C        NDX    TEMP2G
0182   REF   5  LAST 1380      01,3731  4 1054 C        CS     PHSPRDT1        GET THE DELTA T ADDRESS

0183   REF   2  LAST 1381      01,3732  1 5376 1        TCF    ITSLGCL1        NOW GET THE DELTA TIME

0184   REF  26  LAST 1382      01,3733  4 0706 1 ITSWTLST CS    GOLOC +1        CORRECT THE BBCON INFORMATION
0185   REF  27  LAST 1382      01,3734  54 706 1        TS     GOLOC +1
```

L RESTARTS ROUTINE USER'S PAGE NO. 6 E3 S4

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0186   REF   4  LAST 1381   01,3735  5C 156 C          NDX    POINTER    GET THE DT AND FIND OUT IF IT WAS STORED
0187   REF   2  LAST 1381   01,3736  3 2000 C          CA     PRDTTAB    DIRECTLY OR INDIRECTLY

0188   REF   1              01,3737  1 3566 C          TCF    TIMETEST   FIND OUT HOW THE TIME IS STORED

0189   REF  28  LAST 1382   01,3740  56 705 C  ITSAJCB2 XCH    GOLOC      STORE THE CADR

0190   REF   5  LAST 1383   01,3741  50 156 C          NDX    POINTER    ADD THE PRIORITY AND LET:S GO
0191   REF   3  LAST 1383   01,3742  3 2000 C          CA     PRDTTAB

0192   REF   1              01,3743  1 3631 1          TCF    CHKNOVAC

0193   REF   3  LAST 138C   01,3744  3 0157 1  ITSEVEN  CA     TEMPSWCH   SET UP FOR EITHER THE SECOND PART OF THE
0194   REF  29  LAST 1383   01,3745  54 707 C          TS     GOLOC +2   TABLE, OR A RETURN FOR THE NEXT GROUP

0195   REF   9  LAST 1382   01,3746  50 155 C          NDX    TEMP2G     SET UP POINTER FOR OUR LOCATION WITHIN
0196   REF   2  LAST 1381   01,3747  3 2000 C          CA     SIZETAB    THE TABLE
0197   REF   7  LAST 1381   01,3750  6 0154 1          AD     TEMPPHS    THIS MAY LOOK BAD BUT LET:S SEE YOU DO
0198   REF   8  LAST 1383   01,3751  6 0154 1          AD     TEMPPHS    BETTER IN TIME OR NUMBERR OF LOCATIONS
0199   REF   9  LAST 1383   01,3752  6 0154 1          AD     TEMPPHS
0200   REF   6  LAST 1383   01,3753  54 156 1          TS     POINTER

0201   REF   1              01,3754  1 3657 1          TCF    CONTBL2    NOW PROCESS WHAT IS IN THE TABLE

0202   REF  46  LAST 1359   01,3755  3 6214 C  PHSPART2 CA     THREE      SET THE POINTER FOR THE SECOND HALF OF
0203   REF   7  LAST 1383   01,3756  26 156 1          ADS    POINTER    THE TABLE

0204   REF   5  LAST 138C   01,3757  3 3557 C          CA     RTRNCADR   THIS WILL BE OUR LAST TIME THROUGH THE
0205   REF  20  LAST 1383   01,3760  54 707 C          TS     GOLOC +2   EVEN TABLE , SO AFTER IT  GET THE NEXT
A0206                                                                   GROUP
0207   REF   2  LAST 1383   01,3761  1 3657 1          TCF    CONTBL2    SO LET:S GET THE SECOND ENTRY IN THE TBL

0208   REF 67C  LAST 1378      0154                    TEMPPHS  EQUALS MPAC
0209   REF 671  LAST 1383      0155                    TEMP2G   EQUALS MPAC +1
0210   REF 672  LAST 1383      0156                    POINTER  EQUALS MPAC +2
0211   REF 673  LAST 1383      0157                    TEMPSWCH EQUALS MPAC +3
0212   REF   1                 0705                    GOLOC    EQUALS VAC5 +20D
0213   REF   7  LAST 136C      7715                    MINUS2   EQUALS NEG2
0214   REF   9  LAST 1182      6043                    OCT177   EQUALS LOW7

0215   REF   1              01,3762  03755 C  PHS2CADR GENADR PHSPART2
0216   REF   1              01,3763  03533 1  PRT2CADR GENADR GETPART2
0217   REF   4  LAST 128C   01,3764  05231 1  LGCLCADR GENADR LONGCALL
0218   REF  32  LAST 1378   01,3765  05042 1  FVACCADR GENADR FINDVAC
0219   REF  51  LAST 1202   01,3766  05140 1  WTLTCADR GENADR WAITLIST
0220   REF  32  LAST 1368   01,3767  05027 1  NOVACADR GENADR NOVAC
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L IMU MODE SWITCHING ROUTINES USER'S PAGE NO. 1 EO S4

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0001                          5410          BLOCK  02
0002  REF   1                 4000          SETLOC FFTAG3
0003                          5410          BANK

0004  REF   1           E3,1471             EBANK= COMMAND

R0005          FIXED-FIXED ROUTINES.

0006  REF   1                                COUNT  02/IMODE

0007  REF 250  LAST 1380     5410  3 4714 1  ZEROICDU CAF    ZERO          ZERO ICDU COUNTERS.
0008  REF  29  LAST 1329     5411  54 032 1            TS     CDUX
0009  REF  17  LAST 1329     5412  54 033 0            TS     CDUY
0010  REF  23  LAST 1330     5413  54 034 1            TS     CDUZ
0011  REF 318  LAST 1376     5414  0 0002 0            TC     Q

0012  REF  33  LAST 1359     4702            SPSCODE  =      BIT9
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L IMU MODE SWITCHING ROUTINES USER'S PAGE NO. 2 E3 S4

P0013 IMU ZEROING ROUTINE.

```
0014                        11,3721                 BANK    11
0015  REF   1              C7,2000                 SETLOC  MODESW
0016                        07,2516                 BANK

0017  REF   1                                       COUNT   07/IMODE

0018                        07,2516  0 0004 C IMUZERO INHINT                  ROUTINE TO ZERO ICDUS.
0019  REF  39 LAST  380     07,2517  4 1036 1        CS      DSPTAB +11D     DONT ZERO CDUS IF IMU IN GIMBAL LOCK AND
0020  REF   1               07,2520  7 4726 1        MASK    BITS466         COARSE ALIGN (GIMBAL RUNAWAY PROTECTION)
0021  REF 367 LAST 1381     07,2521  10 000 C        CCS     A
0022  REF   1               07,2522  1 2526 C        TCF     IMUZEROA

0023  REF  36 LAST 1324     07,2523  0 5537 C        TC      ALARM           IF SO.
0024                        07,2524   00206 C        OCT     00206

0025  REF   1               07,2525  1 3461 C        TCF     CAGETSTJ +4     IMMEDIATE FAILURE.

0032  REF   2 LAST 1385     07,2526  0 3455 C IMUZEROA TC     CAGETSTJ
R0033                                DO ALL THE WORK.
0034  REF  29 LAST 1031     07,2527  4 1321 1        CS      IMODES33        DISABLE CAP AUTO AND HOLD MODES
0035  REF   2 LAST  524     07,2530  7 4730 0        MASK    SUPER011            BIT5 FOR GROUND
0036  REF  30 LAST 1385     C7,2531  27'321 1        ADS     IMODES33

0037  REF  43 LAST  718     07,2532  4 1320 C        CS      IMODES30        INHIBIT ICDUFAIL AND IMUFAIL (IN CASE WE
0038  REF   1               07,2533  7 5660 C        MASK    BITS364         JUST CAME OUT OF COARSE ALIGN).
0039  REF  44 LAST 1385     C7,2534  27'320 C        ADS     IMODES30

0040  REF   2 LAST 1385     07,2535  4 4726 1        CS      BITS466         SEND ZERO ENCODE WITH COARSE AND ERROR
0041                        07,2536  0 0006 1        EXTEND                  COUNTER DISABLED.
0042  REF  37 LAST  98C     07,2537  03 012 1        WAND    CHAN12

0043  REF   4 LAST  179     07,2540  0 3070 C        TC      NOATTOFF        TURN OFF NO ATT LAMP.

0044  REF  40 LAST 1359     07,2541  3 4706 1        CAF     BIT5
0045                        07,2542  0 0006 1        EXTEND
0046  REF  38 LAST 1385     07,2543  05 012 1        WOR     CHAN12

00461 REF   3 LAST  139     07,2544  0 5410 1        TC      ZEROICDU
0047  REF  46 LAST 1359     07,2545  3 4705 1        CAF     BIT6            WAIT 320 MS TO GIVE AGS ADEQUATE TIME TO
0048  REF  52 LAST 1383     07,2546  0 5140 1        TC      WAITLIST        RECEIVE ITS PULSE TRAIN.
0049  REF   5 LAST  182     E3,1474                 EBANK=  CDUIND
0050  REF   1               07,2547   C2561 1       2CADR   IMUZERO2
0050  REF   1               07,2550   16103 1

0051  REF  45 LAST 1385     07,2551  4 1320 C        CS      IMODES30        SEE IF IMU OPERATING AND ALARM IF NOT.
0052  REF  34 LAST 1384     07,2552  7 4702 1        MASK    BIT9
0053  REF 368 LAST 1385     C7,2553  10 000 C        CCS     A
0054  REF   1               07,2554  1 2557 C        TCF     MODEEXIT
```

L IMU MODE SWITCHING ROUTINES USER'S PAGE NO. 3 E3 S4

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0055  REF  37  LAST 1385   07,2555  0 5537 C          TC      ALARM
0056                       07,2556   00210 1          OCT     210

0057                       07,2557  0 0003 1  MODEEXIT RELINT                GENERAL MODE-SWITCHING EXIT.
0058  REF   7  LAST 1379   07,2560  1 4570 C          TCF     SWRETURN


0059  REF   3  LAST 1385   07,2561  0 3455 C  IMUZERO2 TC      CAGETSTJ      POSSIBLY SWITCH TO TURN-ON PROGRAM
0061  REF   4  LAST 1385   07,2562  0 5410 1          TC      ZEROICDU      ZERO CDUX, CDUY, CDUZ

0062  REF  41  LAST 1385   07,2563  4 4706 C          CS      BIT5          REMOVE ZERO DISCRETE.
0063                       07,2564  0 0006 1          EXTEND
0064  REF  39  LAST 1385   07,2565  03 012 1          WAND    CHAN12

0065  REF  35  LAST 1359   07,2566  3 4700 1          CAF     BIT11         WAIT 10 SECS FOR CTRS TO FIND GIMBALS
0066  REF   4  LAST  158   07,2567  0 5161 1          TC      VARDELAY

0067  REF   4  LAST 1386   07,2570  0 3455 C  IMUZERO3 TC      CAGETSTJ
0069  REF   2  LAST 1385   07,2571  4 5660 C          CS      BITS3&4       REMOVE IMUFAIL AND ICDUFAIL INHIBIT.
0070  REF  46  LAST 1385   07,2572  7 1320 C          MASK    IMODES30
0071  REF  47  LAST 1386   07,2573  55*320 C          TS      IMODES30

0072  REF   3  LAST 1385   07,2574  4 4730 C          CS      SUPER011      ENABLE DAP AUTO AND HOLD MODES
0073  REF  31  LAST 1385   07,2575  7 1321 1          MASK    IMODES33        BIT5 FOR GROUND
0074  REF  32  LAST 1386   07,2576  55*321 1          TS      IMODES33

0075  REF  40  LAST 1057   07,2577  0 4633 0          TC      IBNKCALL      SET ISS WARNING IF EITHER OF ABOVE ARE
0076  REF   5  LAST  153   07,2600   14665 1          CADR    SETISSW       PRESENT.

0077  REF   1              07,2601  1 3433 1          TCF     ENDIMU
```

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P0078           IMU COARSE ALIGN MODE.

0079                            07,2602  0 0004 C  IMUCOARS INHINT
0080   REF   5  LAST 1386      07,2603  0 3455 C            TC      CAGETSTJ
0081   REF   3  LAST  182      07,2604  0 2746 C            TC      SETCCARS

0082   REF  41  LAST 1360      07,2605  3 6211 C            CAF     SIX
0083   REF  53  LAST 1385      07,2606  0 5140 1            TC      WAITLIST
0084   REF   6  LAST 1385      E3,1474                      EBANK=  CDUIND
0085   REF   1                 07,2607   02612 C            2CADR   COARS
0085   REF   1                 07,2610   16103 1

0086   REF   2  LAST 1385      07,2611  1 2557 C            TCF     MODEEXIT

0087   REF   1                 07,2612  0 3443 1  COARS     TC      CAGETEST
0088   REF  47  LAST 1385      07,2613  3 4705 1            CAF     BIT6            ENABLE ALL THREE ISS CDU ERROR COUNTERS
0089                            07,2614  0 0006 1            EXTEND
0090   REF  40  LAST 1386      07,2615  05 012 1            WOR     CHAN12

0091   REF  69  LAST 1379      07,2616  3 4711 1            CAF     TWO             SET CDU INDICATOR
0092   REF   7  LAST 1387      07,2617  55'474 C  COARS1    TS      CDUIND

0093   REF   8  LAST 1387      07,2620  51'474 1            INDEX   CDUIND          COMPUTE THETAD - THETAA IN 1:S
0094   REF  21  LAST 1324      07,2621  3 1155 1            CA      THETAD            COMPLEMENT FORM
0095                            07,2622  0 0006 1            EXTEND
0096   REF   9  LAST 1387      07,2623  5 1474 1            INDEX   CDUIND
0097   REF  30  LAST 1384      07,2624  20 032 1            MSU     CDUX
0098                            07,2625  0 0006 1            EXTEND
0099   REF  45  LAST 1359      07,2626  7 4676 C            MP      BIT13           SHIFT RIGHT 2
0100   REF 221  LAST 1380      07,2627  56 001 C            XCH     L               ROUND
0101                            07,2630  6 0000 1            DOUBLE
0102   REF  14  LAST 1375      07,2631  54 061 1            TS      ITEMP1
0103                            07,2632  1 2634 C            TCF     +2
0104   REF 222  LAST 1387      07,2633  26 001 1            ADS     L

0105   REF  10  LAST 1387      07,2634  51'474 1            INDEX   CDUIND          DIFFERENCE TO BE COMPUTED
0106   REF   2  LAST 1384      07,2635  23'471 1            LXCH    COMMAND
0107   REF  11  LAST 1387      07,2636  11'474 C            CCS     CDUIND
0108   REF   1                 07,2637  0 2617 0            TC      COARS1

0109   REF  70  LAST 1387      07,2640  3 4711 1            CAF     TWO             MINIMUM OF 4 MS WAIT
0110   REF   5  LAST 1386      07,2641  0 5161 1            TC      VARDELAY
```

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0111	REF	2	LAST 1387	07,2642	0 3443	1	COARS2	TC	CAGETEST	DONT CONTINUE IF CAGED.
0112	REF	15	LAST 1387	07,2643	54 061	1		TS	ITEMP1	SETS TC +0.
0113	REF	71	LAST 1387	07,2644	3 4711	1		CAF	TWO	SET CDU INDICATOR
0114	REF	12	LAST 1387	07,2645	55'474	C	+3	TS	CDUIND	
0115	REF	13	LAST 1388	07,2646	51'474	1		INDEX	CDUIND	
0116	REF	3	LAST 1387	07,2647	11'471	C		CCS	COMMAND	NUMBER OF PULSES REQUIRED
0117	REF	1		07,2650	0 2654	1		TC	COMPOS	GREATER THAN MAX ALLOWED
0118	REF	1		07,2651	0 2663	C		TC	NEXTCDU +1	
0119	REF	1		07,2652	0 2721	1		TC	COMNEG	
0120	REF	2	LAST 1388	07,2653	0 2663	C		TC	NEXTCDU +1	
0121	REF	1		07,2654	6 3544	1	COMPOS	AD	-COMMAX	COMMAX = MAX NUMBER OF PULSES ALLOWED
0122				07,2655	0 0006	1		EXTEND		MINUS ONE
0123	REF	1		07,2656	6 2731	C		BZMF	COMZERO	
0124	REF	14	LAST 1388	07,2657	51'474	1		INDEX	CDUIND	
0125	REF	4	LAST 1388	07,2660	55'471	C		TS	COMMAND	REDUCE COMMAND BY MAX NUMBER OF PULSES
0126	REF	1		07,2661	4 3545	1		CS	-COMMAX-	ALLOWED
0127	REF	16	LAST 1388	07,2662	24 061	C	NEXTCDU	INCR	ITEMP1	
0128	REF	16	LAST 1360	07,2663	6 4713	C		AD	NEGO	
0129	REF	15	LAST 1388	07,2664	51'474	1		INDEX	CDUIND	
0130	REF	4	LAST 980	07,2665	54 050	C		TS	CDUXCMD	SET UP COMMAND REGISTER.
0131	REF	16	LAST 1388	07,2666	11'474	C		CCS	CDUIND	
0132	REF	1		07,2667	0 2645	1		TC	COARS2 +3	
0133	REF	17	LAST 1388	07,2670	10 061	1		CCS	ITEMP1	SEE IF ANY PULSES TO GO OUT.
0134	REF	1		07,2671	1 2735	C		TCF	SENDPULS	
0135	REF	13	LAST 778	07,2672	0 5156	C		TC	FIXDELAY	WAIT FOR GIMBALS TO SETTLE.
0136				07,2673	00226	1		DEC	150	
0137	REF	72	LAST 1388	07,2674	3 4711	1		CAF	TWO	AT END OF COMMAND, CHECK TO SEE THAT
0138	REF	18	LAST 1388	07,2675	54 061	1	CHKCORS	TS	ITEMP1	GIMBALS ARE WITHIN 2 DEGREES OF THETAD.
0139	REF	369	LAST 1389	07,2676	50 000	1		INDEX	A	
0140	REF	31	LAST 1387	07,2677	3 0032	C		CA	CDUX	
0141				07,2700	0 0006	1		EXTEND		
0142	REF	19	LAST 1388	07,2701	5 0061	C		INDEX	ITEMP1	
0143	REF	22	LAST 1387	07,2702	21'155	C		MSU	THETAD	
0144	REF	370	LAST 1388	07,2703	10 000	C		CCS	A	
0145	REF	1		07,2704	1 2712	C		TCF	COARSERR	
0146	REF	1		07,2705	1 2707	1		TCF	CORSCHK2	
0147	REF	2	LAST 1388	07,2706	1 2712	C		TCF	COARSERR	

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0148  REF  20  LAST 1388   07,2707  10 061 1  CORSCHK2 CCS    ITEMP1
0149  REF   1              07,2710  1 2675 C           TCF    CHKCORS
0150  REF   2  LAST 1386   07,2711  1 3433 1           TCF    ENDIMU          END OF COARSE ALIGNMENT.

0151  REF   1              07,2712  6 2720 C  COARSERR AD     COARSTOL        2 DEGREES.
0152                       07,2713  0 0006 1           EXTEND
0153  REF   2  LAST 1388   07,2714  6 2707 C           BZMF   CORSCHK2

0154  REF  38  LAST 1386   07,2715  0 5537 C           TC     ALARM           COARSE ALIGN ERROR.
0155                       07,2716   00211 C           OCT    211

0156  REF   2  LAST  138   07,2717  1 3441 1           TCF    IMUBAD

0157                       07,2720   77511 1  COARSTOL DEC    -.01111         2 DEGREES SCALED AT HALF-REVOLUTIONS


0158  REF   2  LAST 1388   07,2721  6 3544 1  COMNEG   AD     -COMMAX
0159                       07,2722  0 0006 1           EXTEND
0160  REF   2  LAST 1388   07,2723  6 2731 C           BZMF   COMZERO
0161                       07,2724  4 0000 C           COM
0162  REF  17  LAST 1388   07,2725  51'474 1           INDEX  CDUIND
0163  REF   5  LAST 1388   07,2726  55'471 C           TS     COMMAND
0164  REF   2  LAST 1388   07,2727  3 3545 C           CA     -COMMAX-
0165  REF   3  LAST 1388   07,2730  0 2662 1           TC     NEXTCDU

0166  REF 251  LAST 1384   07,2731  3 4714 1  COMZERO  CAF    ZERO
0167  REF  18  LAST 1385   07,2732  51'474 1           INDEX  CDUIND
0168  REF   6  LAST 1385   07,2733  57'471 1           XCH    COMMAND
0169  REF   4  LAST 1385   07,2734  0 2662 1           TC     NEXTCDU


0170  REF   6  LAST 1034   07,2735  3 7707 C  SENDPULS CAF    13,14,15
0171                       07,2736  0 0006 1           EXTEND
0172  REF  13  LAST  98C   07,2737  05 014 1           WOR    CHAN14
0173  REF   1              07,2740  3 3546 C           CAF    600MS
0174  REF   2  LAST 1388   07,2741  1 2641 1           TCF    COARS2 -1       THEN TC VARDELAY


0175  REF  48  LAST 1387   07,2742  3 4705 1  CA+ECE   CAF    BIT6            ENABLE ALL THREE ISS CDU ERROR COUNTERS
0176                       07,2743  0 0006 1           EXTEND
0177  REF  41  LAST 1387   07,2744  05 012 1           WOR    CHAN12
0178  REF  65  LAST 1275   07,2745  0 5213 1           TC     TASKOVER
```

```
0179  REF  41  LAST 1355  07,2746  3 4707 C  SETCOARS CAF    BIT4      BYPASS IF ALREADY IN COARSE ALIGN
0180                      07,2747  0 0006 1            EXTEND
0181  REF  42  LAST 1385  07,2750  02 012 C            RAND   CHAN12
0182  REF 371  LAST 1388  07,2751  10 000 0            CCS    A
0183  REF 319  LAST 1384  07,2752  0 0002 C            TC     Q

0184  REF  49  LAST 1389  07,2753  4 4705 C            CS     BIT6      CLEAR ISS ERROR COUNTERS
0185                      07,2754  0 0006 1            EXTEND
0186  REF  43  LAST 139C  07,2755  03 012 1            WAND   CHAN12

0187  REF  40  LAST 1381  07,2756  4 4701 1            CS     BIT10     KNOCK DOWN GYRO ACTIVITY
0188                      07,2757  0 0006 1            EXTEND
0189  REF  14  LAST 1389  07,2760  03 014 1            WAND   CHAN14
0190  REF 252  LAST 1389  07,2761  4 4714 C            CS     ZERO
0191  REF   2  LAST  147  07,2762  54 047 C            TS     GYROCMD

0192  REF  42  LAST 139C  07,2763  3 4707 C            CAF    BIT4      PUT ISS IN COARSE ALIGN
0193                      07,2764  0 0006 1            EXTEND
0194  REF  44  LAST 139C  07,2765  05 012 1            WOR    CHAN12

0195  REF  40  LAST 1385  07,2766  4 1036 1            CS     DSPTAB +11D   TURN ON NO ATT LAMP
0196  REF   1              07,2767  7 3011 0            MASK   OCT40010
0197  REF  41  LAST 139C  07,2770  27'036 1            ADS    DSPTAB +11D

0198  REF  33  LAST 1386  07,2771  4 1321 1            CS     IMODES33  DISABLE DAP AUTO AND HOLD MODES
0199  REF  50  LAST 139C  07,2772  7 4705 C            MASK   BIT6
0200  REF  34  LAST 139C  07,2773  27'321 1            ADS    IMODES33

0201  REF  48  LAST 1386  07,2774  4 1320 C            CS     IMODES30  DISABLE IMUFAIL
0202  REF  43  LAST 139C  07,2775  7 4707 1            MASK   BIT4
0203  REF  49  LAST 139C  07,2776  27'320 C            ADS    IMODES30

0204  REF  42  LAST 1386  07,2777  4 4706 C  RNDREFDR CS     BIT5      KNOCK DOWN TRACK FLAG
0205  REF  24  LAST  986  07,3000  7 0075 1            MASK   FLAGWRD1
0206  REF  25  LAST 139C  07,3001  54 075 1            TS     FLAGWRD1

0207  REF  51  LAST 1373  07,3002  4 4674 1            CS     BIT15     KNOCK DOWN DRIFT FLAG
0208  REF  19  LAST 1192  07,3003  7 0076 1            MASK   FLAGWRD2
0209  REF  20  LAST 139C  07,3004  54 076 1            TS     FLAGWRD2

0210  REF  46  LAST 1387  07,3005  4 4676 C            CS     BIT13     KNOCK DOWN REFSMMAT FLAG
0211  REF   2  LAST  415  07,3006  7 0077 C            MASK   FLAGWRD3
0212  REF   3  LAST 139C  07,3007  54 077 C            TS     FLAGWRD3

0213  REF 32C  LAST 139C  07,3010  0 0002 C            TC     Q

0214                      07,3011   40010 1  OCT40010 OCT    40010
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P0215 IMU FINE ALIGN MODE SWITCH.

```
0216                          C7,3012  0 0004 C  IMUFINE  INHINT
0217  REF   6  LAST 1387     C7,3013  0 3455 C            TC      CAGETSTJ        SEE IF IMU BEING CAGED.

0218  REF   1                 C7,3014  4 3543 1            CS      BITS4-5         RESET ZERO AND COARSE
0219                          C7,3015  0 0006 1            EXTEND
0220  REF  45  LAST 139C     C7,3016  03 012 1            WAND    CHAN12

0221  REF  51  LAST 139C     C7,3017  4 4705 C            CS      BIT6            INSURE DAP AUTO AND HOLD MODES ENABLED
0222  REF  35  LAST 139C     C7,3020  7 1321 1            MASK    IMODES33
0223  REF  36  LAST 1391     C7,3021  55'321 1            TS      IMODES33

0224  REF   5  LAST 1389     C7,3022  0 3070 0            TC      NOATTOFF

0225  REF  41  LAST 139C     C7,3023  3 4701 C            CAF     BIT10           IMU FAIL WAS INHIBITED DURING THE
0226  REF  54  LAST 1387     C7,3024  0 5140 1            TC      WAITLIST        PRESUMABLY PRECEDING COARSE ALIGN. LEAVE
0227  REF  19  LAST 1389     E3,1474                      EBANK=  CDUIND
0228  REF   1                 C7,3025   C3036 1          2CADR   IFAILCK         IT ON FOR THE FIRST 5 SECS OF FINE ALIGN
0228  REF   1                 C7,3026   16103 1

0229  REF   9  LAST  776     C7,3027  3 4735 1            CAF     2SECS
0230  REF  55  LAST 1391     C7,3030  0 5140 1            TC      WAITLIST
0231  REF  2C  LAST 1391     E3,1474                      EBANK=  CDUIND
0232  REF   1                 C7,3031   C3034 C          2CADR   IMUFINED
0232  REF   1                 C7,3032   16103 1

0233  REF   3  LAST 1387     C7,3033  1 2557 C            TCF     MODEEXIT

0234  REF   3  LAST 1388     C7,3034  0 3443 1  IMUFINED TC      CAGETEST        SEE THAT NO ONE HAS CAGED THE IMU.
0235  REF   3  LAST 1389     C7,3035  1 3433 1            TCF     ENDIMU
```

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```
0236  REF   1             07,3036  0 3450 C  IFAILOK  TC      CAGETSTQ        ENABLE IMU FIAL UNLESS IMU BEING CAGED.
0237  REF  66  LAST 1389  07,3037  1 5213 C           TCF     TASKOVER        IT IS.

0238  REF  44  LAST 139C  07,3040  3 4707 C           CAF     BIT4            DONT RESET IMU FAIL INHIBIT IF SOMEONE
0239                       07,3041  0 0006 1           EXTEND                  HAS GONE INTO COARSE ALIGN.
0240  REF  46  LAST 1391  07,3042  02 012 C           RAND    CHAN12
0241  REF 372  LAST 139C  07,3043  10 000 C           CCS     A
0242  REF  67  LAST 1392  07,3044  1 5213 C           TCF     TASKOVER

0243  REF  50  LAST 139C  07,3045  4 1320 C           CS      IMODES30        RESET IMUFAIL.
0244  REF  47  LAST 139C  07,3046  7 4676 C           MASK    BIT13
0245  REF  51  LAST 1392  07,3047  27'320 C          ADS     IMODES30
0246  REF  45  LAST 1392  07,3050  4 4707 1          CS      BIT4
0247  REF  52  LAST 1392  07,3051  7 1320 C  PFAILOK2 MASK    IMODES30
0248  REF  53  LAST 1392  07,3052  55'320 C          TS      IMODES30
0249  REF  41  LAST 1386  07,3053  0 4633 C           TC      IBNKCALL        THE ISS WARNING LIGHT MAY COME ON NOW
0250  REF   6  LAST 1386  07,3054   14665 1          CADR    SETISSW         THAT THE INHIBIT HAS BEEN REMOVED.
0251  REF  68  LAST 1392  07,3055  1 5213 C           TCF     TASKOVER

0252  REF   2  LAST 1392  07,3056  0 3450 C  PFAILOK  TC      CAGETSTQ        ENABLE PIP FAIL PROG ALARM.
0253  REF  69  LAST 1392  07,3057  1 5213 C           TCF     TASKOVER

0254  REF  54  LAST 1392  07,3060  4 1320 C           CS      IMODES30        RESET IMU AND PIPA FAIL BITS.
0255  REF  42  LAST 1391  07,3061  7 4701 1          MASK    BIT10
0256  REF  55  LAST 1392  07,3062  27'320 C          ADS     IMODES30

0257  REF  37  LAST 1391  07,3063  4 1321 1          CS      IMODES33
0258  REF  48  LAST 1392  07,3064  7 4676 C          MASK    BIT13
0259  REF  38  LAST 1392  07,3065  27'321 1          ADS     IMODES33

0260  REF  43  LAST 139C  07,3066  4 4706 C          CS      BIT5
0261  REF   1             07,3067  1 3051 1          TCF     PFAILOK2

0262  REF   2  LAST 139C  07,3070  4 3011 C  NOATTOFF CS      OCT40010        SUBROUTINE TO TURN OFF NO ATT LAMP.
0263  REF  42  LAST 139C  07,3071  7 1036 1          MASK    DSPTAB +11D
0264  REF  52  LAST 139C  07,3072  6 4674 C          AD      BIT15
0265  REF  43  LAST 1392  07,3073  55'036 1          TS      DSPTAB +11D
0266  REF 321  LAST 139C  07,3074  0 0002 C          TC      Q
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P0267 RCUITNES TC INITIATE AND TERMINATE PROGRAM USE OF THE PIPAS. NO IMUSTALL REQUIRED IN EITHER CASE.

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0272   REF 253  LAST 1390   07,3075  4 4714 C  PIPUSE   CS      ZERO
0273   REF  13  LAST  785   07,3076  54 037 1           TS      PIPAX
0274   REF   4  LAST  428   07,3077  54 040 1           TS      PIPAY
0275   REF   7  LAST  784   07,3100  54 041 C           TS      PIPAZ

02752  REF   3  LAST 1392   07,3101  0 3450 C  PIPUSE1  TC      CAGETSTQ     DO NOT ENABLE PIPA FAIL IF IMU IS CAGED
02754  REF   8  LAST 1386   07,3102  1 4570 C           TCF     SWRETURN

02756                       07,3103  0 0004 C           INHINT
0276   REF  78  LAST 1355   07,3104  4 4712 C           CS      BIT1         IF PIPA FAILS FROM NOW ON (UNTIL
0277   REF  56  LAST 1392   07,3105  7 1320 C           MASK    IMODES30     PIPFREE), LIGHT ISS WARNING.
0278   REF  57  LAST 1393   07,3106  55'320 C           TS      IMODES30

0279   REF  42  LAST 1392   07,3107  0 4633 C  PIPFREE2 TC      IBNKCALL     ISS WARNING MIGHT COME ON NOW.
0280   REF   7  LAST 1392   07,3110   14665 1           CADR    SETISSW      (OR GO OFF ON PIPFREE).

0281   REF   4  LAST 1391   07,3111  1 2557 C           TCF     MODEEXIT

0282                       07,3112  0 0004 C  PIPFREE  INHINT                PROGRAM DONE WITH PIPAS. DONT LIGHT
0283   REF  58  LAST 1393   07,3113  4 1320 C           CS      IMODES30     ISS WARNING.
0284   REF  79  LAST 1393   07,3114  7 4712 C           MASK    BIT1
0285   REF  59  LAST 1393   07,3115  27'320 C           ADS     IMODES30

0286   REF  43  LAST 1392   07,3116  7 4701 1           MASK    BIT10        IF PIP FAIL ON, DO PROG ALSRM AND RESET
0287   REF 373  LAST 1392   07,3117  10 000 C           CCS     A            ISS WARNING.
0288   REF   5  LAST 1393   07,3120  1 2557 C           TCF     MODEEXIT

0289   REF  39  LAST 1385   07,3121  0 5537 C           TC      ALARM
0290                       07,3122   00212 C           OCT     212

0291                       07,3123  0 0004 C           INHINT

0292   REF   1              07,3124  1 3107 C           TCF     PIPFREE2
```

```
P0293                THE FOLLOWING ROUTINE TORQUES THE IRIGS ACCORDING TO DOUBLE PRECISION INPUTS IN THE SIX REGISTERS
R0295   BEGINNING AT THE ECADR ARRIVING IN A. THE MINIMUM SIZE OF ANY PULSE TRAIN IS 16 PULSES (.25 CDU COUNTS). THE
R0297   UNSENT PORTION OF THE COMMAND IS LEFT INTACT IN THE INPUT COMMAND REGISTERS.

0299                            E3,1400                         EBANK= 1400             VARIABLE, ACTUALLY.

0300  REF 674  LAST 1383   07,3125  54 161 C  IMUPULSE TS      MPAC +5                 SAVE ARRIVING ECADR.
0301  REF   7  LAST 1391   07,3126  0 3455 C            TC      CAGETSTJ                DONT PROCEED IF IMU BEING CAGED.

0302  REF   3  LAST  435   07,3127  11'304 C            CCS     LGYRC                   SEE IF GYROS BUSY.
0303  REF   1              07,3130  0 3171 C            TC      GYROBUSY                SLEEP.

0304  REF 675  LAST 1394   07,3131  54 156 1            TS      MPAC +2
0305  REF  52  LAST 1391   07,3132  3 4705 1            CAF     BIT6                    ENABLE THE POWER SUPPLY.
0306                        07,3133  0 0006 1            EXTEND
0307  REF  15  LAST 1390   07,3134  05 014 1            WOR     CHAN14

0308  REF  20  LAST 1359   07,3135  3 4710 C            CAF     FOUR
0310  REF  56  LAST 1391   07,3136  0 5140 1  GWAKE2     TC      WAITLIST                (IF A JOB WAS PUT TO SLEEP, THE POWER
0311  REF  21  LAST 1391   E3,1474                       EBANK=  CDUIND                  SUPPLY IS LEFT ON BY THE WAKING JOB).
0312  REF   1              07,3137   03207 1           2CADR   STRTGYRO
0312  REF   1              07,3140   16103 1

0313  REF 676  LAST 1394   07,3141  3 0161 1            CA      MPAC +5                 SET UP EBANK, SAVING CALLER'S EBANK FOR
0314  REF  58  LAST 1363   07,3142  56 003 1            XCH     EBANK                   RESTORATION ON RETURN.
0315  REF 677  LAST 1394   07,3143  56 161 1            XCH     MPAC +5
0316  REF   4  LAST 1394   07,3144  55'304 C            TS      LGYRC                   RESERVES GYROS.
0317  REF  14  LAST 1360   07,3145  7 4373 C            MASK    LOWB
0318  REF  21  LAST 1389   07,3146  54 061 1            TS      ITEMP1

0319  REF  73  LAST 1388   07,3147  3 4711 1            CAF     TWO                     FORCE SIGN AGREEMENT ON INPUTS.
0320  REF 678  LAST 1394   07,3150  54 157 C  GYROAGRE  TS      MPAC +3
0321                        07,3151  6 0000 1            DOUBLE
0322  REF  22  LAST 1394   07,3152  6 0061 C            AD      ITEMP1
0323  REF 679  LAST 1394   07,3153  54 160 1            TS      MPAC +4
0324                        07,3154  0 0006 1            EXTEND
0325  REF 374  LAST 1393   07,3155  5 0000 1            INDEX   A
0326                        07,3156  3 1401 C            DCA     1400
0327  REF 680  LAST 1394   07,3157  52 155 1            DXCH    MPAC
0328  REF  11  LAST 1295   07,3160  0 7226 C            TC      TPAGREE
0329  REF 681  LAST 1394   07,3161  52 155 1            DXCH    MPAC
0330  REF 682  LAST 1394   07,3162  50 160 C            INDEX   MPAC +4
0331                        07,3163  53'401 1            DXCH    1400

0332  REF 683  LAST 1394   07,3164  10 157 C            CCS     MPAC +3
0333  REF   1              07,3165  1 3150 1            TCF     GYROAGRE

0334  REF 684  LAST 1394   07,3166  3 0161 1            CA      MPAC +5                 RESTORE CALLER'S EBANK.
0335  REF  59  LAST 1394   07,3167  54 003 C            TS      EBANK
0336  REF   6  LAST 1393   07,3170  1 2557 C            TCF     MODEEXIT
```

```
P0337           ROUTINES TO ALLOW TORQUING BY ONLY ONE JOB AT A TIME.

0338                            07,3171  0 0006 1  GYROBUSY EXTEND              SAVE RETURN 2FCADR.
0339   REF  20  LAST 1157      C7,3172  3 0134 1            DCA     BUF2
0340   REF 685  LAST 1394      07,3173  52 155 1            DXCH    MPAC
0341   REF   1                 07,3174  3 3206 C  REGSLEEP CAF     LGWAKE
0342   REF   5  LAST 129C      07,3175  1 5070 1            TCF     JOBSLEEP

0343   REF   5  LAST 1394      C7,3176  11'304 C  GWAKE    CCS     LGYRC          WHEN AWAKENED, SEE IF GYROS STILL BUSY.
0344   REF   1                 07,3177  1 3174 1            TCF     REGSLEEP       IF SO, SLEEP SOME MORE.

0345   REF 686  LAST 1395      C7,3200  54 156 1            TS      MPAC +2
0346                            07,3201  0 0006 1            EXTEND
0347   REF 687  LAST 1395      C7,3202  3 0155 C            DCA     MPAC
0348   REF  21  LAST 1395      C7,3203  52 134 0            DXCH    BUF2           RESTORE SWRETURN INFO.
0349   REF 16C  LAST 138C      07,3204  3 4712 1            CAF     ONE
0350   REF   1                 07,3205  1 3136 1            TCF     GWAKE2

0351   REF   1                 07,3206   17176 1  LGWAKE   CADR    GWAKE
```

```
P0352           GYRO-TORQUING WAITLIST TASKS.

0353  REF   1                 07,3207  4 3430 1  STRTGYRO CS     GDESELCT        DE-SELECT LAST GYRO.
0354                          07,3210  0 0006 1           EXTEND
0355  REF  16  LAST 1394     07,3211  03 014 1           WAND     CHAN14

0356  REF   4  LAST 1391     07,3212  0 3443 1           TC       CAGETEST

0357  REF   6  LAST 1395     07,3213  3 1304 1  STRTGYR2 CA       LGYRO           JUMP ON PHASE COUNTER IN BITS 13-14.
0358                          07,3214  0 0006 1           EXTEND
0359  REF  46  LAST 1392     07,3215  7 4707 1           MP       BIT4
0360  REF 375  LAST 1394     07,3216  50 000 1           INDEX    A
0361                          07,3217  1 3220 0           TCF      +1
0362  REF   1                 07,3220  0 3235 0           TC       GSELECT         =0. DO Y GYRO.
0363                          07,3221   00202 1           OCT      00202

0364  REF   2  LAST 1396     07,3222  0 3235 0           TC       GSELECT         =1. DO Z GYRO.
0365                          07,3223   00302 0           OCT      00302

0366  REF   3  LAST 1396     07,3224  0 3233 0           TC       GSELECT -2      =2. DO X GYRO.
0367                          07,3225   00100 0           OCT      00100

0368  REF 254  LAST 1393     07,3226  3 4714 1           CAF      ZERO            =3. DONE
0369  REF   7  LAST 1396     07,3227  55'304 0           TS       LGYRO
0370  REF   2  LAST 1395     07,3230  3 3206 0           CAF      LGWAKE          WAKE A POSSIBLE SLEEPING JOB.
0371  REF   6  LAST 129C     07,3231  0 5074 1           TC       JOBWAKE

0372  REF   2  LAST 1391     07,3232  1 3034 1  NORESET  TCF      IMUFINED        DO NOT RESET POWER SUPPLY
```

L INL MODE SWITCHING ROUTINES USER'S PAGE NO. 14 E3 S4

```
0373   REF  21  LAST 1394   07,3233  4 4710 1   -2      CS      FOUR      SPECIAL ENTRY TO REGRESS LGYRO FOR X.
0374   REF   8  LAST 1396   07,3234  27'304 0           ADS     LGYRC

0375   REF 322  LAST 1392   07,3235  50 002 0   GSELECT INDEX   Q         SELECT GYRO.
0376                        07,3236  3 0000 1           CAF     0         PACKED WORD CONTAINS GYRO SELECT BITS
0377   REF   4  LAST 1375   07,3237  54 064 1           TS      ITEMP4    AND INCREMENT TO LGYRO.
0378   REF  20  LAST 1367   07,3240  7 4716 1           MASK    SEVEN
0379   REF  49  LAST 1392   07,3241  6 4676 1           AD      BIT13
0380   REF   9  LAST 1397   07,3242  27'304 0           ADS     LGYRC
0381   REF  60  LAST 1394   07,3243  54 003 0           TS      EBANK
0382   REF  15  LAST 1394   07,3244  7 4373 0           MASK    LOW8
0383   REF  23  LAST 1394   07,3245  54 061 1           TS      ITEMP1

0384   REF  21  LAST 1397   07,3246  4 4716 1           CS      SEVEN
0385   REF   5  LAST 1397   07,3247  7 0064 1           MASK    ITEMP4
0386   REF   6  LAST 1397   07,3250  54 064 1           TS      ITEMP4

0387                        07,3251  0 0006 1           EXTEND                MOVE DP COMMAND TO RUPTREGS FOR TESTING.
0388   REF  24  LAST 1397   07,3252  5 0061 0           INDEX   ITEMP1
0389                        07,3253  3 1401 0           DCA     1400
0390   REF  28  LAST 1375   07,3254  52 071 0           DXCH    RUPTREG1

0391   REF  29  LAST 1397   07,3255  10 070 1           CCS     RUPTREG1
0392   REF   1              07,3256  1 3271 1           TCF     MAJ+
0393                        07,3257  1 3261 0           TCF     +2
0394   REF   1              07,3260  1 3411 1           TCF     MAJ-

0395   REF   7  LAST 1375   07,3261  10 071 0           CCS     RUPTREG2
0396   REF   1              07,3262  1 3266 1           TCF     MIN+
0397   REF   1              07,3263  1 3213 0           TCF     STRTGYR2
0398   REF   1              07,3264  1 3406 1           TCF     MIN-
0399   REF   2  LAST 1397   07,3265  1 3213 0           TCF     STRTGYR2
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L IMU MODE SWITCHING ROUTINES USER'S PAGE NO. 15 E3 S4

```
0400   REF   1              07,3266  6 3322 1  MIN+     AD      -GYROMIN      SMALL POSITIVE COMMAND. SEE IF AT LEAST
0401                        07,3267  0 0006 1           EXTEND                16 GYRO PULSES.
0402   REF   3  LAST 1397   07,3270  6 3213 1           BZMF    STRTGYR2

0403                        07,3271  0 0006 1  MAJ+     EXTEND                DEFINITE POSITIVE OUTPUT.
0404   REF   1              07,3272  3 3432 1           DCA     GYROFRAC
0405   REF  30  LAST 1397   07,3273  2C 071 C           DAS     RUPTREG1

0406   REF   7  LAST 1397   07,3274  3 0064 C           CA      ITEMP4        SELECT POSITIVE TORQUING FOR THIS GYRO.
0407                        07,3275  0 0006 1           EXTEND
0408   REF  17  LAST 1396   07,3276  05 014 1           WOR     CHAN14

0409   REF  10  LAST 1383   07,3277  3 6043 C           CAF     LOW7          LEAVE NUMBER OF POSSIBLE 8192 AUGMENTS
0410   REF   8  LAST 1397   07,3300  7 0071 C           MASK    RUPTREG2      TO INITIAL COMMAND IN MAJOR PART OF LONG
0411   REF   9  LAST 1398   07,3301  56 071 1           XCH     RUPTREG2      TERM STORAGE AND TRUNCATED FRACTION
0412                        07,3302  0 0006 1  GMERGE   EXTEND                IN MINOR PART. THE MAJOR PART WILL BE
0413   REF  30  LAST 1374   07,3303  7 4703 C           MP      BIT8          COUNTED DOWN TO ZERO IN THE COURSE OF
0414   REF  17  LAST 1375   07,3304  54 062 1           TS      ITEMP2        PUTTING OUT THE ENTIRE COMMAND.
0415   REF  31  LAST 1398   07,3305  3 0070 C           CA      RUPTREG1
0416                        07,3306  0 0006 1           EXTEND
0417   REF  35  LAST 1385   07,3307  7 4702 1           MP      BIT9
0418   REF  32  LAST 1398   07,3310  54 070 1           TS      RUPTREG1
0419   REF 223  LAST 1387   07,3311  3 0001 C           CA      L
0420                        07,3312  0 0006 1           EXTEND
0421   REF  76  LAST 1355   07,3313  7 4675 C           MP      BIT14
0422   REF  18  LAST 1398   07,3314  26 062 1           ADS     ITEMP2        INITIAL COMMAND.

0423                        07,3315  0 0006 1           EXTEND                SEE IF MORE THAN ONE PULSE TRAIN NEEDED
0424   REF  33  LAST 1398   07,3316  3 0071 1           DCA     RUPTREG1      (MORE THAN 16383 PULSES).
0425   REF   1              07,3317  6 7716 C           AD      MINUS1
0426   REF 376  LAST 1396   07,3320  10 000 C           CCS     A
0427   REF   1              07,3321  1 3345 1           TCF     LONGGYRO
0428                        07,3322   776C1 C  -GYROMIN OCT     -176          MAY BE ADJUSTED TO SPECIFY MINIMUM CMD
0429                        07,3323  1 3327 C           TCF     +4

0430   REF  77  LAST 1398   07,3324  3 4675 1           CAF     BIT14
0431   REF  19  LAST 1398   07,3325  26 062 1           ADS     ITEMP2
0432   REF 255  LAST 1396   07,3326  3 4714 1           CAF     ZERO

0433   REF  25  LAST 1397   07,3327  5C 061 C  +4       INDEX   ITEMP1
0434                        07,3330  53'4C1 1           DXCH    1400
```

```
0435   REF  20  LAST 1398   07,3331  3 0062 C           CA      ITEMP2          ENTIRE COMMAND.
0436   REF   3  LAST 139C   07,3332  54 047 C  LASTSEG  TS      GYROCMD
0437                        07,3333  0 0006 1           EXTEND
0438   REF  44  LAST 1393   07,3334  7 4701 1           MP      BIT10           WAITLIST DT
0439   REF  47  LAST 1383   07,3335  6 6214 C           AD      THREE           TRUNCATION AND PHASE UNCERTAINTIES.
0440   REF  57  LAST 1394   07,3336  0 5140 1           TC      WAITLIST
0441   REF  22  LAST 1394   E3,1474                     EBANK=  COUIND
0442   REF   2  LAST 1394   07,3337   03207 1          2CADR   STRTGYRO
0442                        07,3340   16103 1

0448   REF  45  LAST 1399   07,3341  3 4701 C  GYROEXIT CAF     BIT10
0449                        07,3342  0 0006 1           EXTEND
0450   REF  18  LAST 1398   07,3343  05 014 1           WOR     CHAN14
0451   REF  70  LAST 1392   07,3344  1 5213 C           TCF     TASKOVER

0452   REF  26  LAST 1398   07,3345  50 061 C  LONGGYRO INDEX   ITEMP1
0453                        07,3346  53'401 1           DXCH    1400            INITIAL COMMAND OUT PLUS N AUGMENTS OF
0454   REF  78  LAST 1398   07,3347  3 4675 1           CAF     BIT14           8192. INITIAL COMMAND IS AT LEAST 8192.
0455   REF  21  LAST 1399   07,3350  6 0062 C           AD      ITEMP2
0456   REF   4  LAST 1399   07,3351  54 047 C           TS      GYROCMD

0457                        07,3352  0 0006 1  AUG3     EXTEND          GET WAITLIST DT TO TIME WHEN TRAIN IS
0458   REF  46  LAST 1399   07,3353  7 4701 1           MP      BIT10           ALMOST OUT.
0459   REF   4  LAST 136C   07,3354  6 7714 1           AD      NEG3
0460   REF  58  LAST 1399   07,3355  0 5140 1           TC      WAITLIST
0461   REF  23  LAST 1399   E3,1474                     EBANK=  COUIND
0462   REF   1              07,3356   03361 C          2CADR   8192AUG
0462   REF   1              07,3357   16103 1
0463   REF   1              07,3360  1 3341 C           TCF     GYROEXIT

0464   REF   5  LAST 1396   07,3361  0 3443 1  8192AUG  TC      CAGETEST

04641  REF  47  LAST 1396   07,3362  3 4707 C           CAF     BIT4
04642                       07,3363  0 0006 1           EXTEND
04643  REF  47  LAST 1392   07,3364  02 012 C           RAND    CHAN12
04644  REF 377  LAST 1398   07,3365  10 000 C           CCS     A
04645  REF   3  LAST 1389   07,3366  1 3441 1           TCF     IMUBAD
0465   REF  10  LAST 1397   07,3367  3 1304 1           CA      LGYRC           ADD 8192 PULSES TO GYROCMD
0466   REF  61  LAST 1397   07,3370  54 003 C           TS      EBANK
0467   REF  16  LAST 1397   07,3371  7 4373 C           MASK    LOW8
0468   REF  27  LAST 1399   07,3372  54 061 1           TS      ITEMP1

0469   REF  28  LAST 1399   07,3373  50 061 C           INDEX   ITEMP1          SEE IF THIS IS THE LAST AUG.
0470                        07,3374  11'400 C           CCS     1400
0471   REF   1              07,3375  1 3401 C           TCF     AUG2            MORE TO COME.

0472   REF  79  LAST 1399   07,3376  3 4675 1           CAF     BIT14
0473   REF   5  LAST 1399   07,3377  26 047 C           ADS     GYROCMD
0474   REF   1              07,3400  1 3333 C           TCF     LASTSEG +1
```

L IMU MODE SWITCHING ROUTINES USER'S PAGE NO. 17 E3 S4

```
0475   REF  29  LAST 1399   07,3401  50 061 C  AUG2     INDEX  ITEMP1
0476                        07,3402  55'400 C           TS     1400
0477   REF  80  LAST 1399   07,3403  3 4675 1           CAF    BIT14
0478   REF   6  LAST 1399   07,3404  26 047 C           ADS    GYROCMD
0479   REF   1              07,3405  1 3352 1           TCF    AUG3          COMPUTE DT.
```

L IMU MODE SWITCHING ROUTINES USER'S PAGE NO. 18 E3 S4

```
0480  REF   2  LAST 1398   07,3406  6 3322 1  MIN-    AD      -GYRCMIN        POSSIBLE NEGATIVE OUTPUT.
0481                       07,3407  0 0006 1          EXTEND
0482  REF   4  LAST 1398   07,3410  6 3213 1          BZMF    STRTGYR2

0483                       07,3411  0 0006 1  MAJ-    EXTEND                  DEFINITE NEGATIVE OUTPUT.
0484  REF   2  LAST 1398   07,3412  4 3432 C          DCS     GYROFRAC
0485  REF  34  LAST 1398   07,3413  20 071 C          DAS     RUPTREG1

0486  REF   8  LAST 1398   07,3414  3 0064 C          CA      ITEMP4          SELECT NEGATIVE TORQUING FOR THIS GYRO.
0487  REF  36  LAST 1398   07,3415  6 4702 C          AD      BIT9
0488                       07,3416  0 0006 1          EXTEND
0489  REF  19  LAST 1395   07,3417  05 014 1          WOR     CHAN14

0490  REF  35  LAST 1401   07,3420  4 0070 1          CS      RUPTREG1        SET UP RUPTREGS TO FALL INTO GMERGE.
0491  REF  36  LAST 1401   07,3421  54 070 1          TS      RUPTREG1        ALL NUMBERS PUT INTO GYROCMD ARE
0492  REF  10  LAST 1398   07,3422  4 0071 C          CS      RUPTREG2        POSITIVE - BIT9 OF CHAN 14 DETERMINES
0493  REF  11  LAST 1398   07,3423  7 6043 1          MASK    LOW7            THE SIGN OF THE COMMAND.
0494                       07,3424  4 0000 0          COM
0495  REF  11  LAST 1401   07,3425  56 071 1          XCH     RUPTREG2
0496                       07,3426  4 0000 0          COM
0497  REF   1              07,3427  1 3302 1          TCF     GMERGE

0498                       07,3430   01700 1  GOESELCT OCT     1700            TURN OFF SELECT AND ACTIVITY BITS.
0499                       07,3431   00000 1  GYRCFRAC 2DEC   .215 B -21
0499                       07,3432   00034 C
```

P0500 IMU MODE SWITCHING ROUTINES COME HERE WHEN ACTION COMPLETE.

```
0501                          07,3433  0 0006 1  ENDIMU   EXTEND                MODE IS BAD IF CAGE HAS OCCURED OR IF
0502  REF  33  LAST 1187     07,3434  00 011 1            READ    DSALMOUT      ISS WARNING IS ON.
0503  REF  80  LAST 1393     07,3435  7 4712 0            MASK    BIT1
0504  REF 378  LAST 1399     07,3436  10 000 0            CCS     A
0505  REF   4  LAST 1399     07,3437  1 3441 1            TCF     IMUBAD

0506  REF   3  LAST  576     07,3440  1 3467 0  IMUGOOD   TCF     GOODEND       WITH C(A) = 0.

0507  REF 256  LAST 1398     07,3441  3 4714 1  IMUBAD    CAF     ZERO
0508  REF   2  LAST  576     07,3442  1 3464 0            TCF     BADEND

0509  REF  53  LAST 1394     07,3443  3 4705 1  CAGETEST  CAF     BIT6          SUBRCUTINE TO TERMINATE IMU MODE
0510  REF  60  LAST 1393     07,3444  7 1320 0            MASK    IMODES30      SWITCH IF IMU HAS BEEN CAGED.
0511  REF 379  LAST 1402     07,3445  10 000 0            CCS     A
0512  REF   5  LAST 1402     07,3446  1 3441 1            TCF     IMUBAD        DIRECTLY.
0513  REF 323  LAST 1397     07,3447  0 0002 0            TC      Q             WITH C(A) = +0.

0514  REF  61  LAST 1402     07,3450  4 1320 0  CAGETSTQ  CS      IMODES30      SKIP IF IMU NOT BEING CAGED.
0515  REF  54  LAST 1402     07,3451  7 4705 0            MASK    BIT6
0516  REF 380  LAST 1402     07,3452  10 000 0            CCS     A
0517  REF 324  LAST 1402     07,3453  24 002 0            INCR    Q
0518  REF 325  LAST 1402     07,3454  0 0002 0            TC      Q

0519  REF  62  LAST 1402     07,3455  4 1320 0  CAGETSTJ  CS      IMODES30      IF DURING MODE SWITCH INITIALIZATION
0520  REF  55  LAST 1402     07,3456  7 4705 0            MASK    BIT6          IT IS FOUND THAT THE IMU IS BEING CAGED,
0521  REF 381  LAST 1402     07,3457  10 000 0            CCS     A             SET IMUCADR TO -0 TO INDICATE OPERATION
0522  REF 326  LAST 1402     07,3460  0 0002 0            TC      Q             COMPLETE BUT FAILED. RETURN IMMEDIATELY

0523  REF 257  LAST 1402     07,3461  4 4714 0            CS      ZERO          TO SWRETURN.
0524  REF   3  LAST 1192     07,3462  55'322 1            TS      IMUCADR
0525  REF   7  LAST 1394     07,3463  1 2557 0            TCF     MODEEXIT
```

```
P0526           GENERALIZED MODE SWITCHING TERMINATION. ENTER AT GOODEND FOR SUCCESSFUL COMPLETION OF AN I/O OPERATION
R0528   OR AT BADEND FOR A N UNSUCCESSFUL ONE. C(A) OR ARRIVAL =0 FOR IMU, 1 FOR OPTICS.

 0530   REF  12  LAST 1401   07,3464  54 071 C  BADEND   TS      RUPTREG2        DEVICE INDEX.
 0531   REF 258  LAST 1402   07,3465  4 4714 C           CS      ZERO            FOR FAILURE.
 0532   REF   4  LAST 1402   07,3466  1 3471 1           TCF     GOODEND +2

 0533   REF  13  LAST 1403   07,3467  54 071 C  GOODEND  TS      RUPTREG2
 0534   REF 161  LAST 1399   07,3470  4 4712 C           CS      ONE             FOR SUCCESS.

 0535   REF   6  LAST 1375   07,3471  54 072 C           TS      RUPTREG3
 0536   REF  14  LAST 1403   07,3472  50 071 1           INDEX   RUPTREG2        SEE IF USING PROGRAM ASLEEP.
 0537   REF   5  LAST  236   07,3473  11'322 1           CCS     MODECADR
 0538                        07,3474  1 3476 C           TCF     +2              YES - WAKE IT UP.
 0539   REF   1              07,3475  1 3506 C           TCF     ENDMODE         IF 0, PROGRAM NOT IN YET.

 0540   REF 259  LAST 1403   07,3476  3 4714 1           CAF     ZERO            WAKE SLEEPING PROGRAM.
 0541   REF  15  LAST 1403   07,3477  50 071 1           INDEX   RUPTREG2
 0542   REF   6  LAST 1403   07,3500  57'322 0           XCH     MODECADR
 0543   REF   7  LAST 1396   07,3501  0 5074 1           TC      JOBWAKE

 0544   REF   7  LAST 1403   07,3502  4 0072 0           CS      RUPTREG3        ADVANCE LOC IF SUCCESSFUL.
 0545   REF  23  LAST 1290   07,3503  50 064 C           INDEX   LOCCTR
 0546   REF  41  LAST 1187   07,3504  26 164 0           ADS     LOC

 0547   REF  71  LAST 1399   07,3505  1 5213 C           TCF     TASKOVER

 0548   REF   8  LAST 1403   07,3506  3 0072 1  ENDMODE  CA      RUPTREG3        -0 INDICATES OPERATION COMPLETE BUT
 0549   REF  16  LAST 1403   07,3507  50 071 1           INDEX   RUPTREG2        UNSUCCESSFUL - -1 INDICATES COMPLETE AND
 0550   REF   7  LAST 1403   07,3510  55'322 1           TS      MODECADR        SUCCESSFUL.
 0551   REF  72  LAST 1403   07,3511  1 5213 C           TCF     TASKOVER
```

```
P0552           GENERAL STALLING ROUTINE. USING PROGRAMS COME HERE TO WAIT FOR I/O COMPLETION.

R0554   PROGRAM DESCRIPTION                                    DATE- 21 FEB 1967
R0555                                              LOG SECTION IMU MODE SWITCHING
R0556   MOD BY- R.MELANSON TO ADD DOCUMENTATION       ASSEMBLY SUNDISK REV.  82

R0557   FUNCTIONAL DESCRIPTION-
R0558     TO DELAY FURTHER EXECUTION OF THE CALLING ROUTINE UNTIL ITS SELECTED
R0559     I/O FUNCTION IS COMPLETE.THE FOLLOWING CHECKS ON THE CALLING ROUTINE:S
R0560     MODECADR ARE MADE AND ACTED UPON.
R0561       1) +0 INDICATES INCOMPLETE I/O OPERATION.CALLING ROUTINE IS PUT TO
R0562          SLEEP.
R0563       2) -1 INDICATES COMPLETED I/O OPERATION. STALL BYPASSES JOBSLEEP
R0564          CALL AND RETURNS TO CALLING ROUTINE AT L+3
R0565       3) -0 INDICATES COMPLETED I/O WITH FAILURE. STALL CLEARS MODECADR
R0566          AND RETURNS TO CALLING ROUTINE AT L+2.
R0567       4) VALUE GREATER THAN 0 INDICATES TWO ROUTINES CALLING FOR USE OF
R0568          SAME DEVICE. STALL EXITS TO ABORT WHICH EXECUTES A PROGRAM
R0569          RESTART WHICH IN TURN CLEARS ALL MODECADR REGISTERS.

R0570    CALLING SEQUENCE-
R0571     L   TC   BANKCALL
R0572     L+1 CADR (ONE OF 5 STALL ADDRESSES I.E. IMUSTALL,OPTSTALL,RADSTALL,
R0573               AOTSTALL,OR ATTSTALL)

R0574    NORMAL-EXIT MODE-
R0575     TCF   JOBSLEEP OR TCF  MODEXIT

R0576   ALARM OR ABORT EXIT MODE-
R0577     TC   ABORT

R0578   OUTPUT-
R0579     MODECADR= CADR IF JOBSLEEP
R0580     MODECADR=+0     IF I/O COMPLETE
R0581     BLF2=L+3        IF I/O COMPLETE AND GOOD.
R0582     BLF2=L+2 IF I/O COMPLETE BUT FAILED.

R0583   ERASABLE INITIALIZATION-
R0584     BLF2 CONTAINS RETURN ADDRESS PLUS 1,(L+2)
R0585     BLF2+1 CONTAINS FBANK VALUE OF CALLING ROUTINE.
R0586     MODECADR OF CALLING ROUTINE CONTAINS +0,-1,-0 OR  CADR RETURN ADDRESS.

R0587   DEBRIS-
R0588     ALPTREG2 AND CALLING ROUTINE MODECADR.

 0589   REF 162  LAST 1403    07,3512  3 4712 1  AOTSTALL CAF     ONE             AOT.
 0590   REF   1               07,3513  0 3517 1           TC      STALL

 0591   REF  74  LAST 1394    07,3514  3 4711 1  RADSTALL CAF     TWO
 0592   REF   2  LAST 1404    07,3515  1 3517 0           TCF     STALL
```

L IMU MODE SWITCHING ROUTINES

```
0593   REF   1                07,3512                OPTSTALL EQUALS AOTSTALL

0594   REF 260  LAST 1403     07,3516  3 4714 1  IMUSTALL CAF     ZERO          IMU.

0595                          07,3517  0 0004 0  STALL    INHINT
0596   REF  17  LAST 1403     07,3520  54 071 0           TS      RUPTREG2      SAVE DEVICE INDEX.
0597   REF 382  LAST 1402     07,3521  50 000 1           INDEX   A             SEE IF OPERATION COMPLETE.
0598   REF   8  LAST 1403     07,3522  11'322 1           CCS     MODECADR
0599   REF   1                07,3523  1 3541 0           TCF     MODABORT      ALLOWABLE STATES ARE +0, -1, AND -0.
0600   REF   1                07,3524  1 3535 0           TCF     MODESLP       OPERATION INCOMPLETE.
0601   REF   1                07,3525  1 3531 1           TCF     MODEGOOD      COMPLETE AND GOOD IF = -1.

0602   REF  18  LAST 1405     07,3526  50 071 1  MG2      INDEX   RUPTREG2      COMPLETE AND FAILED IF -0. RESET TO +0.
0603   REF   9  LAST 1405     07,3527  55'322 1           TS      MODECADR      RETURN TO CALLER.
0604   REF   8  LAST 1402     07,3530  1 2557 0           TCF     MODEEXIT

0605   REF 383  LAST 1405     07,3531  10 000 0  MODEGOOD CCS     A             MAKE SURE INITIAL STATE -1.
0606   REF   2  LAST 1405     07,3532  1 3541 0           TCF     MODABORT

0607   REF  22  LAST 1395     07,3533  24 133 0           INCR    BUF2          IF SO, INCREMENT RETURN ADDRESS AND
0608   REF   1                07,3534  1 3526 1           TCF     MG2           RETURN IMMEDIATELY, SETTING CADR = +0.

0609   REF   5  LAST  727     07,3535  0 4604 1  MODESLP  TC      MAKECADR      CALL FROM SWITCHABLE FIXED ONLY.
0610   REF  19  LAST 1405     07,3536  50 071 1           INDEX   RUPTREG2
0611   REF  10  LAST 1405     07,3537  55'322 1           TS      MODECADR
0612   REF   6  LAST 1395     07,3540  1 5070 1           TCF     JOBSLEEP

0613   REF   5  LAST 115E     07,3541  0 5622 1  MODABORT TC      POODOO        TWO PROGRAMS USING SAME DEVICE.
0614                          07,3542   01210 0           OCT     1210
```

P0615 CONSTANTS FOR MODE SWITCHING ROUTINES

```
0616  REF   4 LAST 1008      5660                BITS3&4  =       OCT14
0617  REF   5 LAST 136C      4726                BITS4&6  =       OCT50
0618                      07,3543   00030 1     BITS4-5  OCT     00030
0619  REF  31 LAST 1398      4703                IMUSEFLG EQUALS  BIT8          INTERPRETER SWITCH 7.
0620                      07,3544   77500 1     -COMMAX  DEC     -191
0621                      07,3545   77477 0     -COMMAX- DEC     -192
0622                      07,3546   00074 1     600MS    DEC     60
0623  REF   3 LAST  415   07,3012               IMUFIN2C =       IMUFINE
0624  REF   4 LAST  409   07,3547   3 1325 1    GOMANUR  CA      ATTCADR        IS KALCMANU FREE
0625                      07,3550   0 0006 1             EXTEND
0626                      07,3551   1 3554 1             BZF     +3

0627  REF   6 LAST 1405   07,3552   0 5622 1             TC      POODCO         NO
0628                      07,3553    01210 0             OCT     1210           2 TRYING TO USE SAME DEVICE

0629                      07,3554   0 0006 1    +3       EXTEND
0630  REF  23 LAST 1405   07,3555   3 0134 1             DCA     BUF2
0632  REF   5 LAST 1406   07,3556   53'326 0             DXCH    ATTCADR        SAVE FINAL RETURN FOR KALCMAN3

0633  REF  34 LAST 1375   07,3557   3 0006 1             CA      BBANK
0634  REF  22 LAST 1397   07,3560   7 4716 1             MASK    SEVEN
0635  REF   6 LAST 1406   07,3561   27'326 0             ADS     ATTCADR +1

0642  REF  27 LAST 1185   07,3562   3 0167 1             CA      PRIORITY
0643  REF   2 LAST  197   07,3563   7 7674 1             MASK    PRIO37
0644  REF   2 LAST  409   07,3564   55'327 1             TS      ATTPRIO        SAVE USERS PRIO

06452 REF   1             07,3565   3 3571 1             CAF     KALEBCON       SET EBANK FOR KALCMAN3
06453 REF  62 LAST 1399   07,3566   54 003 0             TS      EBANK
06454 REF  62 LAST 1361   07,3567   0 4574 0             TC      POSTJUMP
06455 REF   1             07,3570    44000 1             CADR    KALCMAN3
06456 REF  16 LAST  408   07,3571    03261 1  KALEBCON   ECADR   BCDU
```

L IMU MODE SWITCHING ROUTINES USER'S PAGE NO. 24 E3 S4

```
R0646   PROGRAM DESCRIPTION
R0647   IMU STATUS CHECK ROUTINE R02  (SUBROUTINE UTILITY)
R0648   MCC NO - 1
R0649   MOD BY - N.BRODEUR
R0650   FUNCTIONAL DESCRIPTION
R0651
R0652   TO CHECK WHETHER IMU IS ON AND IF ON WHETHER IT IS ALIGNED TO AN
R0653   ORIENTATION KNOWN BY THE CMC. TO REQUEST SELECTION OF THE APPROPRIATE
R0654   PROGRAM IF THE IMU IS OFF OR NOT ALIGNED TO AN ORIENTATION KNOWN BY THE
R0655   CMC. CALLED THROUGH BANKCALL
R0656   CALLING SEQUENCE-
R0657
R0658   L       TC      BANKCALL
R0659   L+1     CADR    R02BCTH
R0660   SUBROUTINES CALLED
R0661
R0662           VARALARM
R0663           FLAGUP
R0664   NORMAL EXIT MODES
R0665
R0666   AT L+2 OF CALLING SEQUENCE
R0667   ALARM OR ABORT EXIT MODES
R0668           GOTOPOOH, WITH ALARM
R0673   ERASABLE INITIALIZATION REQUIRED
R0674
R0675   NONE
R0676   DEBRIS
R0677
R0678   CENTRALS-A,Q,L
 0679                           34,3777                 BANK    34
 0680   REF   1                 07,2000                 SETLOC  R02
 0681                           07,3572                 BANK
 0682   REF   1                                         COUNT   04/R02          COUNT*

 0683                           07,3572   00063 1 DEC51 DEC     51
 0684   REF  50  LAST 1397      07,3573   3 4676 1 R02BOTH CAF  BIT13
 0685   REF  51  LAST 1165      07,3574   7 0077 0        MASK  STATE +3        REFSMFLG
 0686   REF 384  LAST 1405      07,3575   10 000 0        CCS   A
 0687   REF   2  LAST  719      07,3576   0 3607 0        TC    R02ZERO         ZERO IMUS

 0688   REF  63  LAST 1402      07,3577   3 1320 1        CA    IMODES30
 0689   REF  37  LAST 1401      07,3600   7 4702 1        MASK  BIT9            IS ISS INITIALIZED
 0690                           07,3601   0 0006 1        EXTEND
 0691                           07,3602   1 3604 1        BZF   +2
 0692   REF  48  LAST 1399      07,3603   4 4707 1        CS    BIT4            SEND IMU ALARM CODE 210
 0693   REF   1                 07,3604   6 3612 1        AD    OCT220          SEND REFSMM ALARM
 0694   REF   3  LAST  85C      07,3605   0 5693 1        TC    VARALARM

 0695   REF  70  LAST  85C      07,3606   0 4106 1        TC    GOTOPOOH
```

L INU MODE SWITCHING ROUTINES USER'S PAGE NO. 25 E3 S4

```
0700   REF  52  LAST 1324   07,3607  0 5435 C  RO2ZERO  TC      UPFLAG
0701   REF   4  LAST  418   07,3610   00007 C           ADRES   IMUSE
0702   REF   9  LAST 1393   07,3611  1 4570 C           TCF     SWRETURN
07025                       07,3612   00220 1  OCT220   OCT     220
```

L IMU MODE SWITCHING ROUTINES USER'S PAGE NO. 26 E3 S4

```
R0703   PROGRAM DESCRIPTION   P06   10FEB67

R0704   TRANSFER THE ISS/CMC FROM THE OPERATE TO THE STANDBY CONDITION.

R0705   THE NORMAL CONDITION OF READINESS OF THE GNCS WHEN NOT IN USE IS STANDBY. IN THIS CONDITION THE IMU
R0707   HEATER POWER IS ON. THE IMU OPERATE POWER IS OFF. THE COMPUTER POWER IS ON. THE OPTICS POWER IS OFF. THE
R0709   CMC  STANDBY ON THE MAIN AND LEB DISKYS IS ON.

R0710   CALLING SEQUENCE:
R0711           ASTRONAUT REQUEST THROUGH DSKY     V37E 06E.

R0712   SUBROUTINES CALLED:
R0713           GOPERF1
R0716           BANKCALL
R0719           FLAGDOWN
```

```
P0810   PRESTAND PREPARES FOR STANDBY BY SNAPSHOTTING THE SCALER AND TIME1 TIME2
R0811   THE LOW 5 BITS OF THE SCALER ARE INSPECTED TO INSURE COMPATABILITY
R0812   BETWEEN THE SCALER READING AND THE TIME1 TIME2 READING.

 08125  REF    1                26,2000                        SETLOC P05PC6
 08126                           26,3655                        BANK

 0813   REF    3  LAST  201       1150                        EBANK= TIME2SAV
 0814   REF    1                                              COUNT* $$/P06

 08145  REF   53  LAST 1408     26,3655   0 5435 C  P06       TC     UPFLAG          SET NODOV37 BIT
 08146  REF    3  LAST 1280     26,3656    00054 C            ADRES  NODOFLAG

 0815                           26,3657   0 0004 C  PRESTAND  INHINT
 0816                           26,3660   0 0006 1            EXTEND
 0817   REF   31  LAST 1382     26,3661   3 0025 C            DCA    TIME2           SNAPSHOT TIME1TIME2
 0818   REF    4  LAST 1410     26,3662  53'151 1            DXCH   TIME2SAV
 0819   REF    1                26,3663   0 3714 C            TC     SCALPREP
 0820   REF    1                26,3664   0 3657 C            TC     PRESTAND        T1,T2,SCALER NOT COMPATIBLE
 0821   REF  688  LAST 1395     26,3665   52 155 1            DXCH   MPAC            T1,T2 AND SCALER OK
 0822   REF    1                26,3666  53'153 C            DXCH   SCALSAVE        STORE SCALER
 0823                           26,3667   0 0004 C            INHINT
 0824   REF  246  LAST 1034     26,3670   0 4555 C            TC     BANKCALL
 0825   REF    3  LAST  149     26,3671    16777 1            CADR   RNDREFDR        REFSMM, DRIFT, TRACK FLAGS DOWN

 0826   REF   55  LAST 1280     26,3672   0 5447 C            TC     DOWNFLAG
 0827   REF    5  LAST 1408     26,3673    00007 C            ADRES  IMUSE           IMUSE DOWN
 08271  REF   56  LAST 1410     26,3674   0 5447 C            TC     DOWNFLAG
 08272  REF    5  LAST  608     26,3675    00010 C            ADRES  RNDVZFLG        RNDVZFLG DOWN

 0828   REF   36  LAST 1386     26,3676   3 4700 1            CAF    BIT11
 0829                           26,3677   0 0006 1            EXTEND
 0830   REF   14  LAST 1065     26,3700   05 013 C            WOR    CHAN13          SET STANDBY ENABLE BIT

 0831   REF  102  LAST 1373     26,3701   0 5301 C            TC     PHASCHNG        SET RESTART TO POSTAND WHEN STANDBY
 0832                           26,3702    07024 C            OCT    07024             RECOVERS
 0833                           26,3703    20000 C            OCT    20000
 08335  REF    2  LAST 1410       1152                        EBANK= SCALSAVE
 0834   REF    1                26,3704    03734 1            2CADR  POSTAND
 0834   REF    1                26,3705    54102 C
 0835   REF    1                26,3706   3 4731 C            CAF    OCT62
 0836   REF  247  LAST 1410     26,3707   0 4555 C            TC     BANKCALL
 0837   REF    7  LAST  733     26,3710    20751 C            CADR   GOPERF1
 0838                           26,3711   1 3706 1            TCF    -3
 0839                           26,3712   1 3706 1            TCF    -4
 0840                           26,3713   1 3706 1            TCF    -5

 08405  REF    8  LAST 1034       4731                OCT62   EQUALS .5SEC           DEC 50 = OCT 62

R0841   THE LOW 5 BITS OF THE SCALER READS 10000 FOR THE FIRST INTERVAL AFTER A
```

```
R0842   T1 INCREMENT. IF SCALPREP DETECTS THIS INTERVAL THE T1,T2 AND SCALER
R0843   DATA ARE NOT COMPATABLE AND RETURN IS TO L+1 FOR ANOTHER READING OF THE
R0844   DATA. OTHERWISE, THE RETURN IS TO L+2 TO PROCEED. ROUTINE ALSO PREPARES
R0845   THE SCALER READING FOR COMPUTATION OF THE INCREMENT TO UPDATE T1T2. (THE
R0846   10 MS BIT (BIT 6) OF THE SCALER IS INCREMENTED 5 MS OUT OF PHASE FROM
R0847   T1.) ADDITION OF 5 MS (BIT 5) TO THE SCALER READING HAS THE EFFECT OF
R0848   ADJUSTING BIT 6 IN THE SCALER TO BE IN PHASE WITH BIT 1 OF T1. THE LOW 5
R0849   BITS OF THE SCALER READING ARE THEN SET TO ZERO, TO TRUNCATE THE SCALER
R0850   DATA TO 10 MS. RESULTS ARE STORED IN MPAC, +1.

 0851                          26,3714  0 0006 1  SCALPREP EXTEND
 0852   REF 689  LAST 1410     26,3715  22 156 C          QXCH  MPAC    +2
 0853   REF   3  LAST  422     26,3716  0 4527 C          TC    FINETIME +1
 0854                          26,3717  0 0003 1          RELINT
 0855   REF 690  LAST 1411     26,3720  52 155 1          DXCH  MPAC
 0856   REF  44  LAST 1392     26,3721  3 4706 1          CA    BIT5            ADD 5 MS TO THE SCALER READING.
 0857   REF 224  LAST 1398     26,3722  54 001 1          TS    L
 0858   REF 261  LAST 1405     26,3723  3 4714 1          CA    ZERO
 0859   REF 691  LAST 1411     26,3724  20 155 1          DAS   MPAC
 0860   REF   9  LAST  354     26,3725  4 4362 C          CS    LOW5            SET LOW 5 BITS OF (SCALER+5MS) TO ZERO
 0861   REF 692  LAST 1411     26,3726  7 0155 1          MASK  MPAC    +1      AND STORE RESULTS IN MPAC,+1.
 0862   REF 693  LAST 1411     26,3727  56 155 C          XCH   MPAC    +1
 0863   REF  10  LAST 1411     26,3730  7 4362 C          MASK  LOW5            TEST LOW 5 BITS OF SCALER FOR THE FIRST
A0864                                                                          INTERVAL AFTER THE T1 INCREMENT
A0865                                                                          (NOW = 00000, SINCE BIT 5 ADDED).
 0866   REF 385  LAST 1407     26,3731  10 000 C          CCS   A               IS IT 1ST INTERVAL AFTER T1 INCREMENT
 0867   REF 694  LAST 1411     26,3732  24 156 C          INCR  MPAC +2         NO
 0868   REF 695  LAST 1411     26,3733  0 0156 C          TC    MPAC +2         YES

R0869   POSTAND RECOVERS TIME AFTER STANDBY.THE SCALER IS SNAPSHOTTED AND THE
R0870   TIME1 TIME2 COUNTER IS SET TO ZERO. THE LOW 5 BITS OF THE SCALER ARE
R0871   INSPECTED TO INSURE COMPATABILITY BETWEEN THE SCALER READING AND THE
R0872   CLEARING OF THE TIME COUNTER. IT THEN COMPUTES THE DIFFERENCE IN SCALER
R0873   VALUES (IN DP) AND ADDS THIS TO THE PREVIOUSLY SNAPSHOTTED VALUES OF
R0874   TIME1 TIME2 AND PLACES THIS NEW TIME INTO THE TIME1 TIME2 COUNTER.

 0875   REF   1                                  COUNT* $$/P05

 0876   REF  37  LAST 141C     26,3734  4 4700 C  POSTAND CS    BIT11           RECOVER TIME AFTER STANDBY.
 0877                          26,3735  0 0006 1          EXTEND
 0878   REF  15  LAST 141C     26,3736  03 013 C          WAND  CHAN13          CLEAR STANDBY ENABLE BIT
 0879                          26,3737  0 0004 C          INHINT
 0880   REF 262  LAST 1411     26,3740  3 4714 1          CA    ZERO
 0881   REF 225  LAST 1411     26,3741  54 001 1          TS    L
 0882   REF  32  LAST 141C     26,3742  52 025 1          DXCH  TIME2           CLEAR TIME1TIME2
 0883   REF   2  LAST 141C     26,3743  0 3714 C          TC    SCALPREP        STORE SCALER IN MPAC, MPAC+1
 0884   REF   2  LAST 141C     26,3744  0 3737 1          TC    POSTAND +3      T1,T2,SCALER NOT COMPATIBLE
 0885                          26,3745  0 0006 1          EXTEND                T1,T2 AND SCALER OK
 0886   REF   3  LAST 141C     26,3746  4 1153 C          DCS   SCALSAVE
 0887   REF 696  LAST 1411     26,3747  20 155 1          DAS   MPAC            FORM DP DIFFERENCE OF POSTSTANDBY SCALER
```

L IMU MODE SWITCHING ROUTINES USER'S PAGE NO. 29 E2 S4

```
0888  REF  47  LAST 1399   26,3750  3 4701 C          CAF     BIT10       MINUS PRESTANDBY SCALER AND SHIFT RIGHT
0889  REF   9  LAST  372   26,3751  0 7256 1          TC      SHORTMP     5 TO ALIGN BITS WITH TIME1TIME2.
0890  REF 263  LAST 1411   26,3752  3 4714 1          CAF     ZERO
0891  REF 697  LAST 1411   26,3753  54 156 1          TS      MPAC    +2  NEEDED FOR TP AGREE
0892  REF  12  LAST 1394   26,3754  0 7226 C          TC      TPAGREE     MAKE DP DIFF AGREE
0893  REF 698  LAST 1412   26,3755  10 154 C          CCS     MPAC
0894  REF   1              26,3756  0 3763 C          TC      POSTCOM     IF DP DIFF NET +, NO SCALER OVERFLOW
0895  REF   2  LAST 1412   26,3757  0 3763 C          TC      POSTCOM     BETWEEN PRE AND POST STANDBY.
0896                       26,3760  0 3761 1          TC      +1          IF DP DIFF NET -, SCALER OVERFLOWED. ADD
0897  REF  48  LAST 1412   26,3761  3 4701 C          CAF     BIT10       BIT 10 TO HIGH DIFF TO CORRECT.
0898  REF 699  LAST 1412   26,3762  26 154 C          ADS     MPAC
0899                       26,3763  0 0006 1  POSTCOM  EXTEND
0900  REF   5  LAST 141C   26,3764  3 1151 C          DCA     TIME2SAV    PRESTANDBY TIME1TIME2
0901  REF 7CC  LAST 1412   26,3765  20 155 1          DAS     MPAC
0902  REF  13  LAST 1412   26,3766  0 7226 C          TC      TPAGREE     FORCE SIGN AGREEMENT
0903  REF 7C1  LAST 1412   26,3767  52 155 1          DXCH    MPAC        UPDATED VALUE FOR T1,T2.
0904  REF  33  LAST 1411   26,3770  20 025 1          DAS     TIME2       LOAD UPDATED VALUE INTO T1,T2, WITH
09045 REF  57  LAST 141C   26,3771  0 5447 C          TC      DOWNFLAG    CLEAR NODOFLAG
09046 REF   4  LAST 141C   26,3772   00054 C          ADRES   NODOFLAG

0905  REF  71  LAST 1407   26,3773  0 4106 1          TC      GOTOPOOH
```

L KEYRUPT, UPRUPT USER'S PAGE NO. 1 EQ S4

```
0001                          14,3751                        BANK   14
0002  REF    1                07,2000                        SETLOC KEYRUPT
0003                          07,3613                        BANK
0004  REF    1                                               COUNT* $$/KEYUP

0005  REF   25  LAST 1199     07,3613  54 016 1  KEYRUPT1    TS     BANKRUPT
0006  REF  327  LAST 1402     07,3614  56 002 0              XCH    Q
0007  REF   20  LAST 1199     07,3615  54 012 0              TS     QRUPT
0008  REF    2  LAST  348     07,3616  0 4414 1              TC     LODSAMPT       TIME IS SNATCHED IN RUPT FOR NOUN 65.
0009  REF   11  LAST 1411     07,3617  3 4362 1              CAF    LOW5
0010                          07,3620  0 0006 1              EXTEND
0011  REF    2  LAST  184     07,3621  02 015 1              RAND   MNKEYIN       CHECK IF KEYS 5M-1M ON
0012  REF    6  LAST 1375     07,3622  54 073 1  KEYCOM      TS     RUPTREG4
0013  REF   14  LAST  651     07,3623  4 0101 0              CS     FLAGWRD5
0014  REF   53  LAST 1392     07,3624  7 4674 1              MASK   BIT15
0015  REF   15  LAST 1413     07,3625  26 101 0              ADS    FLAGWRD5

0016  REF    6  LAST 1171     07,3626  3 4371 0  ACCEPTUP    CAF    CHRPRIO        (NOTE: RUPTREG4 = KEYTEMP1)
0017  REF   33  LAST 1383     07,3627  0 5027 1              TC     NOVAC
0018  REF   66  LAST  368        0777                        EBANK= DSPCOUNT
0019  REF    1                07,3630   02000 0              2CADR  CHARIN
0019  REF    1                07,3631   60101 1
0020  REF    7  LAST 1413     07,3632  3 0073 0              CA     RUPTREG4
0021  REF   24  LAST 1403     07,3633  50 064 0              INDEX  LOCCTR
0022  REF  702  LAST 1412     07,3634  54 154 0              TS     MPAC           LEAVE 5 BIT KEY CDE IN MPAC FOR CHARIN
0023  REF   48  LAST 1066     07,3635  0 5222 0              TC     RESUME
```

P0024 UPRUPT PROGRAM

```
0025  REF  26  LAST 1413  07,3636  54 016 1  UPRUPT  TS    BANKRUPT
0026  REF 328  LAST 1413  07,3637  56 002 C           XCH   Q
0027  REF  21  LAST 1413  07,3640  54 012 C           TS    QRUPT
0028  REF   3  LAST 1413  07,3641  0 4414 1           TC    LODSAMPT      TIME IS SNATCHED IN RUPT FOR NOUN 65.
0029  REF 264  LAST 1412  07,3642  3 4714 1           CAF   ZERO
0030  REF   2  LAST  187  07,3643  56 045 C           XCH   INLINK
0031  REF   2  LAST  127  07,3644  54 073 1           TS    KEYTEMP1
0032  REF  34  LAST 1359  07,3645  3 4710 C           CAF   BIT3          TURN ON UPACT LIGHT
0033                      07,3646  0 0006 1           EXTEND              (BIT 3 OF CHANNEL 11)
0034  REF  34  LAST 1402  07,3647  05 011 1           WOR   DSALMOUT
0035  REF  12  LAST 1413  07,3650  3 4362 1  UPRPT1   CAF   LOW5          TEST FOR TRIPLE CHAR REDUNDANCY
0036  REF   3  LAST 1414  07,3651  7 0073 1           MASK  KEYTEMP1      LOW5 OF WORD
0037  REF   4  LAST 1414  07,3652  56 073 C           XCH   KEYTEMP1      LOW5 INTO KEYTEMP1
0038                      07,3653  0 0006 1           EXTEND
0039  REF  49  LAST 1412  07,3654  7 4701 1           MP    BIT10         SHIFT RIGHT 5
0040  REF   1             07,3655  54 734 C           TS    KEYTEMP2
0041  REF  13  LAST 1414  07,3656  7 4362 C           MASK  LOW5          MID 5
0042  REF   1             07,3657  6 3713 1           AD    HI10
0043  REF   1             07,3660  0 3710 1           TC    UPTEST
0044  REF  50  LAST 1414  07,3661  3 4701 C           CAF   BIT10
0045                      07,3662  0 0006 1           EXTEND
0046  REF   2  LAST 1414  07,3663  7 0734 C           MP    KEYTEMP2      SHIFT RIGHT 5
0047  REF  14  LAST 1414  07,3664  7 4362 C           MASK  LOW5          HIGH 5
0048                      07,3665  4 0000 C           COM
0049  REF   2  LAST 1414  07,3666  0 3710 1           TC    UPTEST

0050  REF   1             07,3667  4 3716 C  UPOK     CS    ELRCODE       CODE IS GOOD. IF CODE = 'ERROR RESET',
0051  REF   5  LAST 1414  07,3670  6 0073 C           AD    KEYTEMP1      CLEAR UPLOCKFL(SET BIT4 OF FLAGWRD7 = 0)
0052                      07,3671  0 0006 1           EXTEND              IF CODE DOES NOT = 'ERROR RESET', ACCEPT
0053  REF   1             07,3672  1 3700 1           BZF   CLUPLOCK      CODE ONLY IF UPLOCKFL IS CLEAR (=0).

0054  REF  49  LAST 1407  07,3673  3 4707 C           CAF   BIT4          TEST UPLOCKFL FOR 0 OR 1.
0055  REF  19  LAST  774  07,3674  7 0103 1           MASK  FLAGWRD7
0056  REF 386  LAST 1411  07,3675  10 000 C           CCS   A
0057  REF  49  LAST 1413  07,3676  0 5222 C           TC    RESUME        UPLOCKFL = 1
0058  REF   1             07,3677  0 3626 C           TC    ACCEPTUP      UPLOCKFL = 0

0059  REF  50  LAST 1414  07,3700  4 4707 1  CLUPLOCK CS    BIT4          CLEAR UPLOCKFL (I.E., SET BIT4 OF
0060  REF  20  LAST 1414  07,3701  7 0103 1           MASK  FLAGWRD7      FLAGWRD7 = 0)
0061  REF  21  LAST 1414  07,3702  54 103 1           TS    FLAGWRD7
0062  REF   2  LAST 1414  07,3703  0 3626 C           TC    ACCEPTUP

A0063                                                                   CODE IS BAD
0064  REF  22  LAST 1414  07,3704  4 0103 1  TMFAIL2  CS    FLAGWRD7      LOCK OUT FURTHER UPLINK ACTIVITY
0065  REF  51  LAST 1414  07,3705  7 4707 1           MASK  BIT4          (BY SETTING UPLOCKFL = 1) UNTIL
0066  REF  23  LAST 1414  07,3706  26 103 1           ADS   FLAGWRD7      'ERROR RESET' IS SENT VIA UPLINK.
0067  REF  50  LAST 1414  07,3707  0 5222 C           TC    RESUME
0069  REF   6  LAST 1414  07,3710  6 0073 C  UPTEST   AD    KEYTEMP1
```

```
0070  REF 387  LAST 1414   07,3711  10 000 0          CCS   A
0071  REF   1               07,3712  0 3704 1          TC    TMFAIL2
0072                        07,3713   77740 1  HI10     OCT   77740
0073  REF   2  LAST 1415    07,3714  0 3704 1          TC    TMFAIL2
0074  REF 329  LAST 1414    07,3715  0 0002 0          TC    Q

0075                        07,3716   00022 1  ELRCODE  OCT   22

R0076  'UPLINK ACTIVITY LIGHT' IS TURNED OFF BY .....
R0077            1.    VBRELDSP
R0078            2.    ERROR RESET
R0079            3.    UPDATE PROGRAM(P27) ENTERED BY V70,V71,V72,AND V73.


R0080
R0081  THE RECEPTION OF A BAD CODE(I.E  CCC FAILURE) LOCKS OUT FURTHER UPLINK ACTIVITY BY SETTING BIT4 OF FLAGWRD7 = 1.
R0083  THIS INDICATION WILL BE TRANSFERRED TO THE GROUND BY THE DOWNLINK WHICH DOWNLINKS ALL FLAGWORDS.
R0085  WHEN UPLINK ACTIVITY IS LOCKED OUT ,IT CAN BE ALLOWED WHEN THE GROUND UPLINKS AND 'ERROR RESET' CODE.
R0087  (IT IS RECOMMENDED THAT THE 'ERROR LIGHT RESET' CODE IS PRECEEDED BY 16 BITS THE FIRST OF WHICH IS 1 FOLLOWED
R0089  BY 15 ZEROES. THIS WILL ELIMINATE EXTRANEOUS BITS FROM INLINK WHICH MAY HAVE BEEN LEFT OVER FROM THE ORIGINAL
R0091  FAILURE)
R0092  UPLINK ACTIVITY IS ALSO ALLOWED(UNLOCKED) DURING FRESH START WHEN FRESH START SETS BIT4 OF FLAGWRD7 = 0.
```

L DISPLAY INTERFACE ROUTINES USER'S PAGE NO. 1 EO S4

R0001 DISPLAYS CAN BE CLASSIFIED INTO THE FOLLOWING CATEGORIES-

R0002 1. PRIORITY DISPLAYS- DISPLAYS WHICH TAKE PRIORITY OVER ALL OTHER DISPLAYS. USUALLY THESE DISPLAYS ARE SENT
R0004 OUT UNDER CRITICAL ALARM CONDITIONS.
R0005 2. EXTENDED VERB DISPLAYS- ALL EXTENDED VERBS AND MARK ROUTINES SHOULD USE EXTENDED VERB (MARK) DISPLAYS.
R0007 3. NORMAL DISPLAYS- ALL MISSION PROGRAM DISPLAYS WHICH INTERFACE WITH THE ASTRONAUT DURING THE NORMAL
R0009 SEQUENCE OF EVENTS.
R0010 4. MISC. DISPLAYS- ALL DISPLAYS NOT HANDLED BY THE DISPLAY INTERFACEROUTINES. THESE INCLUDE SUCH DISPLAYS AS
R0012 NN DISPLAYS AND SPECIAL PURPOSE DISPLAYS HANDLED BY PINBALL.

R0013 5. ASTRONAUT INITIATED DISPLAYS- ALL DISPLAYS INITIATED EXTERNALLY.
R0014 THE FOLLOWING TERMS ARE USED TO DESCRIBE THE STATUS OF DISPLAYS-

R0015 1. ACTIVE-THE DISPLAY WHICH IS (1) BEING DISPLAYED TO THE ASTRONAUT AND WAITING FOR A RESPONSE OR
R0017 (2) WAITING FIRST IN LINE FOR THE ASTRONAUT TO FINISH USING THE DSKY OR (3) BEING DISPLAYED ON THE DSKY
R0019 BUT NOT WAITING FOR A RESPONSE.
R0020 2. INACTIVE -A DISPLAY WHICH HAS (1) BEEN ACTIVE BUT WAS INTERRUPTEDBY A DISPLAY OF HIGHER PRIORITY,
R0022 (2) BEEN PUT INTO THE WAITING LIST AT TIME IT WAS REQUESTED DUE TO THE FACT A HIGHER PRIORITY DISPLAY
R0024 WAS ALREADY GOING, (3) BEEN INTERRUPTED BY THE ASTRONAUT (CALLED A PINBRANCH CONDITION, SINCE THIS TYPE
R0026 OF INACTIVE DISPLAY IS USUALLY REACTIVATED ONLY BY PINBALL) OR (4) A DISPLAY WHICH HAS FINISHED BUT STILL
R0028 HAS INFO SAVED FOR RESTART PURPOSES.

R0029 DISPLAY PRIORITIES WORK AS FOLLOWS-

R0030 INTERRUPTS-
R0031 1. THE ASTRONAUT CAN INTERRUPT ANY DISPLAY WITH AN EXTERNAL DISPLAY REQUEST.
R0033 2. INTERNAL DISPLAYS CAN NOT BE SENT OUT WHEN THE ASTRONAUT IS USING THE DSKY.
R0035 3. PRIORITY DISPLAYS INTERRUPT ALL OTHER TYPES OF INTERNAL DISPLAYS. A PRIORITY DISPLAY INTERRUPTING ANOTHER
R0037 PRIORITY DISPLAY WILL CAUSE AN ABORT UNLESS BIT14 IS SET FOR THE LINUS ROUTINE.
R0039 4. A MARK DISPLAY INTERRUPTS ANY NORMAL DISPLAY.
R0040 5. A MARK THAT INTERRUPTS A MARK COMPLETELY REPLACES IT.

R0041 ORDER OF WAITING DISPLAYS-
R0042 1. ASTRONAUT EXTERNAL USE
R0043 2. PRIORITY
R0044 3. INTERRUPTED MARK
R0045 4. INTERRUPTED NORMAL

R0046 5. MARK TO BE REQUESTED (SEE DESCRIPTION OF ENDMARK)
R0047 6. MARK WAITING
R0048 7. NORMAL WAITING

L DISPLAY INTERFACE ROUTINES USER'S PAGE NO. 2 EO S4

R0049 THE DISPLAY ROUTINES ARE INTENDED TO SERVE AS AN INTERFACE BETWEEN THE USER AND PINBALL. THE
R0051 FOLLOWING STATEMENTS CAN BE MADE ABOUT NORMAL DISPLAYS AND PRIORITY DISPLAYS (A DESCRIPTION OF MARK ROUTINES
R0053 WILL FOLLOW LATER):

R0054 1. ALL ROUTINES THAT END IN R HAVE AN IMMEDIATE RETURN TO THE USER. FOR ALL FLASHING DISPLAYS THIS RETURN
R0056 IS TO THE USERS CALL CADR +4. FOR THE ONLY NON FLASHING IMMEDIATE RETURN DISPLAY (GODSPR) THIS RETURN
R0058 IS TO THE USERS CALLING LOC +1.
R0059 2. ALL ROUTINES NOT ENDING IN R DO NOT DO AN IMMEDIATE RETURN TO THE USER.
R0061 3. ALL ROUTINES THAT END IN R START A SEPARATE JOB (MAKEPLAY) WITH USERS JOB PRIORITY.
R0063 4. ALL ROUTINES NOT ENDING IN R BRANCH DIRECTLY TO MAKEPLAY WHICH MAKES THESE DISPLAYS A PART OF THE
R0065 USERS JOB.
R0066 5. ALL DISPLAY ROUTINES ARE CALLED VIA BANKCALL.
R0067 6. TO RESTART A DISPLAY THE USER WILL GENERALLY USE A PHASE OF ONE WITH DESIRED RESTART GROUP (SEE
R0069 DESCRIPTION OF RESTARTS).
R0070 7. ALL FLASHING DISPLAYS HAVE 3 RETURNS TO THE USER FROM ASTRONAUT RESPONSES. A TERMINATE (V34) BRANCHES
R0072 TO THE USERS CALL CADR +1. A PROCEED (V33) BRANCHES TO THE USERS CALL CADR +2. AN ENTER OR RECYCLE
R0074 (V32) BRANCHES TO THE USERS CALL CADR +3.
R0075 8. ALL ROUTINES MUST BE USED UNDER EXECUTIVE CONTROL.

R0076 A DESCRIPTION OF EACH ROUTINE WITH AN EXAMPLE FOLLOWS:

R0077 GODSP IS USED TO DISPLAY A VERB NOUN ARRIVING IN A. NO RETURN IS MADE TO THE USER.

R0079 1. GODSP IS NOT RESTARTABLE
R0080 2. A VERB PASTE WITH GODSP ALWAYS TURNS ON THE FLASH.

```
A0081                                   CAF     VXXNYY
A0082                                   TC      BANKCALL
A0083                                   CADR    GODSP

A0084                           VXXNYY  OCT     0XXYY
```

R0085 GODSPR IS THE SAME AS GODSP ONLY RETURN IS TO THE USER.

```
A0086                                   CAF     VXXNYY
A0087                                   TC      BANKCALL
A0088                                   CADR    GODSPR

A0089                                   ...     ...             IMMEDIATE RETURN OF GODSPR
```

R0090 GOFLASH DISPLAYS A FLASHING VERB NOUN WITH NO IMMEDIATE RETURN TO THE USER. 3 RETURNS ARE POSSIBLE FROM
R0092 THE ASTRONAUT (SEE NO. 7 ABOVE).

```
A0093                                   CAF     VXXNYY          VXX NYY WILL BE A FLASHING VERB NOUN.
A0094                                   TC      BANKCALL
A0095                                   CADR    GOFLASH
A0096                                   ...     ...             TERMINATE RETURN
A0097                                   ...     ...             PROCEED RETURN
A0098                                   ...     ...             ENTER OR RECYCLE RETURN
```

R0099 GOPERF1 IS ENTERED WITH DESIRED CHECKLIST VALUE IN A. GOPERF1 WILL DISPLAY THIS VALUE IN R1 BY MEANS OF A

```
R0101   V01 N25.A FLASHING PLEASE PERFORM ON CHECKLIST ( V50 N25) IS THEN DISPLAYED.  NO IMMEDIATE RETURN IS MADE TO
R0103   USER (SEE NO. 7 ABOVE).

R0104   GOPERF1 BLANKS REGISTERS R2 AND R3

A0105                                   CAF     OCTXX           CODE FOR CHECKLIST VALUE XX
A0106                                   TC      BANKCALL
A0107                                   CADR    GOPERF1
A0108                                   ...     ...             TERMINATE RETURN
A0109                                   ...     ...             PROCEED RETURN
A0110                                   ...     ...             ENTER RETURN

R0111   GOPERF2 IS ENTERED WITH A VARIABLE NOUN AND V01 ( V00 FOR N10 OR N11) IN A.  GOPERF2 WILL FIRST DISPLAY THE
R0113   REQUESTED NOUN BY MEANS OF A V01NYY OR A V00NYY. PLEASE PERFORM ON NOUN (V50 NYY) THEN BECOMES A FLASHING
R0115   DISPLAY.  NO IMMEDIATE RETURN IS MADE TO THE USER (SEE NO. 7 ABOVE).

R0116   GOPERF2 DOES NOT BLANK ANY REGISTERS

A0117                                   CAF     VXXNYY          VARIABLE NOUN YY. XX=00 OR 01.
A0118                                   TC      BANKCALL
A0119                                   CADR    GOPERF2
A0120                                   ...     ...             TERMINATE RETURN
A0121                                   ...     ...             PROCEED RETURN
A0122                                   ...     ...             ENTER RETURN

R0123   GOPERF3 IS USED FOR A PLEASE PERFORM ON A PROGRAM NUMBER.  THE DESIRED PROGRAM NO. IS ENTERED IN A.  GOPERF3
R0125   DISPLAYS THE NO. BY MEANS OF A V06 N07 FOLLOWED BY A FLASHING V50 N07 FOR A PLEASE PERFORM. NO IMMEDIATE RETURN
R0127   IS MADE TO THE USER (SEE NO. 7 ABOVE).

R0128   GOPERF3 BLANKS REGISTERS R2 AND R3

A0129                                   CAF     DECXX           REQUEST PERFORM ON PXX
A0130                                   TC      BANKCALL
A0131                                   CADR    GOPERF3
A0132                                   ...     ...             TERMINATE RETURN
A0133                                   ...     ...             PROCEED RETURN
A0134                                   ...     ...             ENTER RETURN

R0135   GOPERF4 IS USED FOR A PLEASE PERFORM ON AN OPTION. THE DESIRED OPTION ISENTERED IN A AND STORED IN OPTION1.
R0137   GOPERF4 DISPLAYS R1 AND R2 BY MEANS OF A V04N06 FOLLOWED BY A FLASHING  V50N06 FOR A PLEASE PERFORM. NO
R0139   IMMEDIATE RETURN IS MADE TO THE USER (SEE NO. 7 ABOVE).

A0140                                   CAF     OCTXX           REQUEST PERFORM ON OPTION XX
A0141                                   TC      BANKCALL
A0142                                   CADR    GOPERF4
A0143                                   ...     ...             TERMINATE RETURN
A0144                                   ...     ...             PROCEED RETURN
A0145                                   ...     ...             ENTER RETURN

R0146   GOPERF4 BLANKS REGISTER R3
```

```
R0147   GOODSPRET IS USED TO DISPLAY A VERB NOUN ARRIVING IN A WITH A RETURN TO THE USER AFTER THE DISPLAY HAS BEEN SENT
R0149   OUT.

A0150                                   CAF     VXXNYY
A0151                                   TC      BANKCALL
A0152                                   CADR    GOODSPRET

A0153                                   ...     ...             RETURN TO USER

R0154   REGODSP IS USED TO DISPLAY A VERB NOUN ARRIVING IN A.  REGODSP IS THE SAME AS GODSP ONLY REGODSP REPLACES ANY
R0156   ACTIVE NORMAL DISPLAY IF ONE WAS ACTIVE.

A0157                                   CAF     VXXNYY
A0158                                   TC      BANKCALL
A0159                                   CADR    REGODSP

R0160   REFLASH IS THE SAME AS GOFLASH ONLY REFLASH REPLACES ANY ACTIVE NORMAL DISPLAY IF ONE WAS ACTIVE.

A0162                                   CAF     VXXNYY          VXX NYY WILL BE A FLASHING VERB NOUN
A0163                                   TC      BANKCALL
A0164                                   CADR    REFLASH
A0165                                   ...     ...             TERMINATE RETURN
A0166                                   ...     ...             PROCEED RETURN
A0167                                   ...     ...             ENTER RETURN

R0168   GOFLASHR IS SAME AS GOFLASH ONLY AN IMMEDIATE RETURN IS MADE TO THE USERS CALL CADR +4.

A0170                                   CAF     VXXNYY
A0171                                   TC      BANKCALL
A0172                                   CADR    GOFLASHR
A0173                                   ...     ...             TERMINATE RETURN
A0174                                   ...     ...             PROCEED RETURN
A0175                                   ...     ...             ENTER OR RECYCLE RETURN

A0176                                   ...     ...             IMMEDIATE RETURN FROM GOFLASHR

R0177   GOPERF1R IS THE SAME AS GOPERF1 ONLY GOPERF1R HAS AN IMMEDIATE RETURN TOUSERS CALL CADR +4.

R0179   GOPERF1R BLANKS REGISTERS R2 AND R3

A0180                                   CAF     OCTXX           CODE FOR CHECKLIST VALUE XX.
A0181                                   TC      BANKCALL
A0182                                   CADR    GOPERF1R
A0183                                   ...     ...             TERMINATE RETURN
A0184                                   ...     ...             PROCEED RETURN
A0185                                   ...     ...             ENTER RETURN

A0186                                   ...     ...             IMMEDIATE RETURN FROM GOPERF1R

R0187   GOPERF2R IS THE SAME AS GOPERF2 ONLY AN IMMEDIATE RETURN IS MADE TO USERS CALL CADR +4.
```

```
R0189   GOPERF2R DOES NOT BLANK ANY REGISTERS

A0190                           CAF     VXXNYY          VARIABLE NOUN YY REQUESTED.  XX=00 OR 01
A0191                           TC      BANKCALL
A0192                           CADR    GOPERF2R
A0193                           ...     ...             TERMINATE RETURN
A0194                           ...     ...             PROCEED RETURN
A0195                           ...     ...             ENTER RETURN

A0196                           ...     ...             IMMEDIATE RETURN HERE FROM GOPERF2R

R0197   GOPERF3R IS THE SAME AS GOPERF3 ONLY AN IMMEDIATE RETURN IS MADE TO USERS CALL CADR +4.

R0199   GOPERF3R BLANKS REGISTERS R2 AND R3

A0200                           CAF     PROGXX          PERFORM PROGRAM XX
A0201                           TC      BANKCALL
A0202                           CADR    GOPERF3R
A0203                           ...     ...             TERMINATE RETURN
A0204                           ...     ...             PROCEED RETURN
A0205                           ...     ...             ENTER RETURN

A0206                           ...     ...             GOPERF3R IMMEDIATELY RETURNS HERE

R0207   GOPERF4R IS THE SAME AS GOPERF4 ONLY AN IMMEDIATE RETURN IS MADE TO USERS CALL CADR +4.

A0209                           CAF     OCTXX           REQUEST PERFORM ON OPTIONXX
A0210                           TC      BANKCALL
A0211                           CADR    GOPERF4R
A0212                           ...     ...             TERMINATE RETURN
A0213                           ...     ...             PROCEED RETURN
A0214                           ...     ...             ENTER RETURN

A0215                           ...     ...             IMMEDIATE RETURN TO USER

R0216   GOPERF4R BLANKS REGISTER R3

R0217   REFLASHR IS THE SAME AS REFLASH ONLY AN IMMEDIATE RETURN IS MADE TO THE USERS CALL CADR +4.

A0219                           CAF     VXXNYY          VXX NYY WILL BE A FLASHING VERB NOUN
A0220                           TC      BANKCALL
A0221                           CADR    REFLASHR
A0222                           ...     ...             TERMINATE RETURN
A0223                           ...     ...             PROCEED RETURN
A0224                           ...     ...             ENTER RETURN

A0225                           ...     ...             IMMEDIATE RETURN TO USER

R0226   REGODSPR IS THE SAME AS REGODSP ONLY A RETURN (IMMEDIATE) IS MADE TO THE USER.
```

```
A0228                           CAF     VXXNYY
A0229                           TC      BANKCALL
A0230                           CADR    REGODSPR

A0231                           ...     ...             IMMEDIATE RETURN TO USER
```

```
R0232   GOMARK IS USED TO DISPLAY A MARK VERB NOUN ARRIVING IN A. NO RETURN IS MADE TO THE USER.

R0234   GOXDSP = GOMARK

A0235                                   CAF     VXXNYY          VXXNYY CONTAINS VERB AND NOUN
A0236                                   TC      BANKCALL
A0237                                   CADR    GOMARK          OTHER EXTENDED VERBS USE CADR GOXDSP

R0238   GOMARKR IS THE SAME AS GOMARK ONLY RETURN IS TO THE USER.

R0239   GOXDSPR = GOMARKR

A0240                                   CAF     VXXNYY
A0241                                   TC      BANKCALL
A0242                                   CADR    GOMARKR         OTHER EXTENDED VERBS USE CADR GOXDSPR

A0243                                   ...     ...             IMMEDIATE RETURN OF GOMARKR

R0244   GOMARKF DISPLAYS A FLASHING MARK VERB NOUN WITH NO IMMEDIATE RETURN TO THE USER. 3 RETURNS ARE POSSIBLE FROM
R0246   THE ASTRONAUT (SEE NO. 7 ABOVE ).

R0247   GOXDSPF = GOMARKF

A0248                                   CAF     VXXNYY          VXXNYY WILL BE A FLASHING MARK VERB NOUN
A0249                                   TC      BANKCALL
A0250                                   CADR    GOMARKF         OTHER EXTENDED VERBS USE CADR GOXDSPF
A0251                                   ...     ...             TERMINATE RETURN
A0252                                   ...     ...             PROCEED RETURN
A0253                                   ...     ...             ENTER OR RECYCLE RETURN

R0254   GOMARKFR IS THE SAME AS GOMARKF ONLY AN IMMEDIATE RETURN IS MADE TO THE USER CALL CADR +4.

R0256   GOXDSPFR = GOMARKFR

A0257                                   CAF     VXXNYY          FLASHING MARK VERB NOUN
A0258                                   TC      BANKCALL
A0259                                   CADR    GOMARKFR        OTHER EXTENDED VERBS USE CADR GOXDSPFR
A0260                                   ...     ...             TERMINATE RETURN
A0261                                   ...     ...             PROCEED RETURN
A0262                                   ...     ...             ENTER OR RECYCLE RETURN

A0263                                   ...     ...             IMMEDIATE RETURN TO THE USER

R0264   GOMARK1 IS USED FOR A PLEASE PERFORM ON A MARK REQUEST WITH ONLY 1 ASTRONAUT RETURN TO THE USER. NO IMMEDIATE
R0266   RETURN IS MADE. THE DESIRED MARK PLEASE PERFORM VERB AND DESIRED NOUN ISENTERED IN A. GOMARK1 DISPLAYS R1, R2, R
R0268   MEANS OF A V05NYY FOLLOWED BY A FLASHING V5XNYY FOR A PLEASE PERFORM. THE ASTRONAUT WILL RESPOND WITH A MARK
R0270   OR MARK REJECT OR AN ENTER. THE ENTER IS THE ONLY ASTRONAUT RESPONSE THAT WILL COME BACK TO THE USER.

A0272                                   CAF     V5XNYY          X=1,2,3,4   Y= NOUN
A0273                                   TC      BANKCALL
```

```
A0274                                   CADR    GOMARK1

A0275                                   ...     ...             ENTER RETURN

R0276   *** IF BLANKING DESIRED ON NON R ROUTINES, NOTIFY DISPLAYER.

R0277   GOMARK1R IS THE SAME AS A GOMARK1 ONLY AN IMMEDIATE RETURN IS MADE TO THE USERS CALL CADR +2.
A0279                                   CAF     V5XNYY          X=1,2,3,4   YY = NOUN
A0280                                   TC      BANKCALL
A0281                                   CADR    GOMARK1R

A0282                                   ...     ...             ASTRONAUT ENTER RETURN
A0283                                   ...     ...             IMMEDIATE RETURN TO USER

R0284   GOMARK2 IS THE SAME AS GOMARK1 ONLY 3 RETURNS ARE MADE TO THE USER FROM THE ASTRONAUT.
A0286                                   CAF     V5XNYY          X=1,2,3,4   YY=NOUN
A0287                                   TC      BANKCALL
A0288                                   CADR    GOMARK2
A0289                                   ...     ...             TERMINATE RETURN
A0290                                   ...     ...             PROCEED RETURN
A0291                                   ...     ...             ENTER RETURN
R0292   GOMARK2R IS THE SAME AS GOMARK1R ONLY 3 ASTRONAUT RETURNS ARE MADE TO THE USER.

A0294                                   CAF     V5XNYY          X=0,1,2,3,4   YY=NOUN
A0295                                   TC      BANKCALL
A0296                                   CADR    GOMARK2R
A0297                                   ...     ...             TERMINATE RETURN
A0298                                   ...     ...             PROCEED RETURN
A0299                                   ...     ...             ENTER RETURN

A0300                                   ...     ...             IMMEDIATE RETURN TO THE USER

R0301   GOMARK3 IS USED FOR A PLEASE PERFORM ON A MARK REQUEST WITH A 3 COMP. DEC DISPLAY. THE DESIRED MARK PLEASE
R0303   PERFORM VERB AND NOUN ARE ENTERED IN A. GOMARK3 DISPLAYS R1, R2, R3 BY MEANS OF A V06NYY FOLLOWED BY A FLASHING
R0305   V5XNYY FOR A PLEASE PERFORM. GOMARK3 HAS 3 ASTRONAUT RETURNS TO THE USER WITH NO IMMEDIATE RETURN.

A0307                                   CAF     V5XNYY          X=1, 2,3,4 YY=NOUN
A0308                                   TC      BANKCALL
A0309                                   CADR    GOMARK3
A0310                                   ...     ...             TERMINATE RETURN
A0311                                   ...     ...             PROCEED RETURN
A0312                                   ...     ...             ENTER RETURN

R0313   GOMARK4 IS THE SAME AS GOMARK3 ONLY R2 AND R3 ARE BLANKED AND R1 IS DISPLAYED IN OCTAL.

A0315                                   CAF     V5XNYY          X=1,2,3,4 YY=NOUN
A0316                                   TC      BANKCALL
A0317                                   CADR    GOMARK4
A0318                                   ...     ...             TERMINATE RETURN
A0319                                   ...     ...             PROCEED RETURN
```

```
A0320                                   ...     ...             ENTER RETURN

R0321   EXDSPRET IS USED TO DISPLAY A VERB NOUN ARRIVING IN A WITH A RETURN MADE TO THE USER AFTER THE DISPLAY HAS BEEN
R0323   SENT OUT.

A0324                                   CAF     VXXNYY
A0325                                   TC      BANKCALL
A0326                                   CADR    EXDSPRET

A0327                                   ...     ...             RETURN TO USER

R0328   KLEENEX CLEANS OUT ALL MARK DISPLAYS (ACTIVE AND INACTIVE). A RETURN IS MADE TO THE USER AFTER THE MARK DISPLAYS
R0330   HAVE BEEN CLEANED OUT.

A0331                                   TC      BANKCALL
A0332                                   CADR    KLEENEX

A0333                                   ...     ...             RETURN TO USER

R0334   MARKBRAN IS A SPECIAL PURPOSE ROUTINE USED FOR SAVING JOB VAC AREAS (SEE DESCRIPTION OF MARKBRAN BELOW).

A0336                                   TC      BANKCALL
A0337                                   CADR    MARKBRAN

A0338                                   ...     ...             BAD RETURN IF MARK DISPLAY NOT ACTIVE

A0339                                                           (GOOD RETURN TO IMMEDIATE RETURN LOC OF
A0340                                                           LAST FLASHING MARK R ROUTINE)

R0341   PINBRNCH REESTABLISHES THE LAST ACTIVE FLASHING DISPLAY. IF THERE IS NO ACTIVE FLASHING DISPLAY, THE DSKY IS
R0343   BLANKED AND CONTROL IS SENT TO ENDOFJOB.

A0344                                   TC      POSTJUMP
A0345                                   CADR    PINBRNCH

R0346   PRIODSP IS USED AS A PRIORITY DISPLAY.  IT WILL DISPLAY A GOFLASH TYPE DISPLAY WITH THREE POSSIBLE RETURNS FROM
R0348   THE ASTRONAUT(SEE NO.7 ABOVE).

R0349        THE MAIN PURPOSE OF PRIODSP IS TO REPLACE THE PRESENT DISPLAY WITH A DISPLAY OF HIGHER PRIORITY AND TO
R0351   PROVIDE A MEANS FOR RESTORING THE OLD DISPLAY WHEN THE PRIORITY DISPLAY
R0352   IS RESPONDED TO BY THE ASTRONAUT.

R0353        THE FORMER DISPLAY IS RESTORED BY AN AUTOMATIC BRANCH TO WAKE UP THE DISPLAY THAT WAS INTERRUPTED BY THE
R0355   PRIO DISPLAY.

A0356                                   CAF     VXXNYY          VXXNYY WILL BE A FLASHING VERB NOUN
A0357                                   TC      BANKCALL
A0358                                   CADR    PRIODSP
A0359                                   ...     ...             TERMINATE RETURN
A0360                                   ...     ...             PROCEED RETURN
```

```
A0361                                   ...     ...             ENTER OR RECYCLE RETURN

R0362   PRICOSPR IS THE SAME AS PRICOSPONLY AN IMMEDIATE RETURN IS MADE TO THE  USERS CALL CADR +4.

A0364                                   CAF     VXXNYY          VXXNYY WILL BE A FLASHING VERB NOUN
A0365                                   TC      BANKCALL
A0366                                   CADR    PRICOSPR
A0367                                   ...     ...             TERMINATE RETURN
A0368                                   ...     ...             PROCEED RETURN
A0369                                   ...     ...             ENTER OR RECYCLE RETURN

A0370                                   ...     ...             IMMEDIATE RETURN

R0371   PRICLARM DOES A VD5N09 PRICOSPR.
R0372   CLEANDSP CLEANS OUT ALL NORMAL DISPLAYS (ACTIVE AND INACTIVE). A RETURN IS MADE TO THE USER AFTER NORMAL
R0374   DISPLAYS ARE CLEANED OUT.

A0375                                   TC      BANKCALL
A0376                                   CADR    CLEANDSP

A0377                                   ...     ...             RETURN TO USER
```

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P0378   GENERAL INFORMATION
R0379   ------- -----------


R0380   ALARM OR ABORT EXIT MODES--

A0381                                   PRIOBORT TC     ABORT
A0382                                           OCT     1502

R0383   PRIOBORT IS BRANCED TO WHEN (1)  A NORMAL DISPLAY IS REQUESTED AND  ANOTHER NORMAL DISPLAY IS ALREADY ACTIVE
R0385   (REFLASH AND REGODSP ARE EXCEPTIONS) OR (2) A PRIORITY DISPLAY IS REQUESTED WHEN ANOTHER PRIORITY DISPLAY IS
R0387   ALREADY ACTIVE (A PRIORITY WITH LINUS BIT14 IS AN EXCEPTION).


R0388   ERASABLE INITIALIZATION REQUIRED--

R0389           ACCOMPLISHED BY FRESH START- 1. FLAGWRD4 (USED EXCLUSIVELY BY DISPLAY INTERFACE ROUTINES)
R0391                                        2. NVSAVE = NORMAL VERB AND NOUN      REGISTER.
R0393                                        3. EBANKTEM = NORMAL INACTIVE FLAGWORD(ALSO CONTAINS NORMALS EBANK).


R0395                                        5. RISAVE = MARKBRAN CONTROL WORD
R0396                                        4. RESTREG = PRIORITY 30 AND SUPERBANK 3.
R0398   OUTPUT--
R0399           NVWORD = PRIO VERB AND NOUN
R0400           NVWORD +1(MARKNV) = MARK VERB AND NOUN
R0401           NVWORD +2(NVSAVE) = NORMAL VERB AND NOUN

R0402           DSPFLG(EBANKSAV) = PRIO FLAGWORD (INCLUDING EBANK)
R0403           DSPFLG +1(MARKEBAN) = MARK FLAGWORD (INCLUDING EBANK)
R0404           DSPFLG +2(EBANKTEM) = NORMAL FLAGWORD (INCLUDIG EBANK)

R0405           CADRFLSH = PRIO USERS CALL CADR +1 LOCATION
R0406           CADRFLSH +1(MARKFLSH) = MARK USERS CALL CADR +1 LOCATION
R0407           CADRFLSH +2(TEMPFLSH) = NORMAL USERS CALL CADR +1 LOCATION

R0408           PRIOTIME = TIME EACH PRIO REQUEST FIRST SENT OUT
R0409           OPTION1 = DESIRED OPTION FROM GOPERF4
R0410           FLAGWRD4 = BIT INFO FOR CONTROL OF ALL DISPLAY ROUTINES
R0411           DSPTEM1 = R1 INFO FOR ASTRONAUT FROM PERFORM DISPLAYS(NORMAL)
R0412   SUBROUTINES USED-- NVSUB, FLAGUP, FLAGDOWN, ENDOFJOB, BLANKSUB, ABORT, JOBWAKE, JOBSLEEP, FINDVAC, PRIOCHNG,
R0414   JAMTERM, NVSUBUSY, FLASHON, ENDIDLE, CHANG1, BANKJUMP, MAKECADR, NOVAC,
R0415   DEBRIS-- (STORED INTO)

R0416           TEMPORARY TEMPORARIES- A, Q, L, MPAC +2, MPAC +3, MPAC +4, MPAC +5, MPAC +6, RUPTREG2, RUPTREG3, CYL,
R0418   EBANK, RUPTREG4, LOC, BANKSET, MODE, MPAC, MPAC +1                              4, FACEREG
R0420           ERASABES(SHARED AND USED WITH OTHER PROGRAMS) CADRSTOR, DSPLIST, LOC, DSPTEM1, OPTION1

R0422           ERASABLES(USED ONLY BY DISPLAY ROUTINES)- NVWORD,+1,+2, DSPFLG,+1,+2, CADRFLSH,+1,+2, PRIOTIME, FLAGWRD4,
```

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R0424   R1SAVE, MARK2PAC,


R0425   DEBRIS-- (USED BUT NOT STORED INTO)- NOUNREG, VERBREG, LOCCTR, MONSAVE1
R0426   FLAGWORD DESCRIPTIONS--
R0427       FLAGWRD4- SEE DESCRIPTION UNDER LOG SECTION ERASABLE ASSIGNMENTS

R0428       DSPFLG, DSPFLG+1, DSPFLG +2-
R0429       ----------------------------
R0430   BITS 1 BLANK R1
R0431        2 BLANK R2
R0432        3 BLANK R3
R0433        4 FLASHING DISPLAY REQUESTED
R0434        5 PERFORM DISPLAY REQUESTED
R0435        6 -----              EXDSPRET          GOODSPRET
R0436        7 PRIO DISPLAY       -----              -----
R0437        8 -----          DEC MARK PERFORM       -----
R0438        9 EBANK
R0439       10 EBANK
R0440       11 EBANK
R0441       12 -----              -----        V99PASTE
R0442       13 2ND PART OF PERFORM
R0443       14 REFLASH OR REDO   -----              REFLASH OR REDO
R0444       15 -----             MARK REQUEST       -----
R0445   RESTARTING DISPLAYS--

R0446   RULES FOR THE DSKY OPERATOR--

R0447       1. PROCEED AND TERMINATE SERVE AS RESPONSES TO REQUESTS FOR OPERATOR RESPONSE (FLASHING V/N). AS LONG
R0449          AS THERE IS ANY REQUEST AWAITING OPERATOR RESPONSE, ANY USE OF PROCEED OR TERMINATE WILL SERVE AS
R0451          RESPONSES TO THAT REQUEST. CARE SHOULD BE EXERCISED IN ATTEMPTING TO KILL AN OPERATOR INITIATED MONITOR
R0453          WITH PROCEED AND TERMINATE FOR THIS REASON.
R0454       2. THE ASTRONAUT MUST RESPOND TO A PRIORITY DISPLAY NO SOONER THAN 5 SECS FROM THE TIME THE MISSION
R0456          PROGRAM SENT OUT THE REQUEST FOR OPERATOR RESPONSE (THE ASTRONAUT WOULD SEE THIS DISPLAY FOR LESS TIME
R0458          DUE TO TIME IT TAKES TO GET DISPLAY SENT OUT.) IF THE ASTRONAUT RESPONDS TOO SOON, THE PRIORITY DISPLAY
R0460          IS SENT OUT AGAIN---AND AGAIN UNTIL AN ACCUMULATED 5 SECS FROM TIME THE FIRST PRIORITY DISPLAY WAS SENT
R0462          OUT. THE SAME 5 SEC. DELAY WILL OCCUR AT 163.84 SECS OR IN ANY MULTIPLE OF THAT TIME DUE TO PROGRAM
R0464          CONSIDERATION.
R0465       3. KEY RELEASE BUTTON-
R0466          A) IF THE KEY RELEASE LIGHT IS ON, IT SIMPLY RELEASES THE KEYBOARD AND DISPLAY FOR INTERNAL USE.
R0468          B) IF THE KEY RELEASE LIGHT IS OFF, AND IF SOME REQUEST FOR OPERATOR RESPONSE (FLASHING V/N) IS STILL
R0470             AWAITING RESPONSE  THEN IT RE-ESTABLISHES THE DISPLAYS THAT ORIGINALLY REQUESTED RESPONSE.
R0472          IF AN OPERATOR WANTS THEREFORE TO RE-ESTABLISH BUT CONDITION (A) IS ENCOUNTERED, A SECOND DEPRESSION OF
R0474          KEY RELEASE BUTTON MAY BE NECESSARY.
R0475       4. IT IS IMPORTANT TO ANSWER ALL REQUESTS FOR OPERATOR RESPONSE.
R0476       5. IT IS ALWAYS GOOD PRACTICE TO TERMINATE AN EXTENDED VERB BEFORE ASKING FOR ANOTHER ONE OR THE SAME ONE
R0478          OVER AGAIN.


R0479   SPECIAL CONSIDERATIONS--
```

```
R0480       1. MPAC +2  SAVEC ONLY IN MARK DISPLAYS
R0481       2. GODSP(R),REGODSP(R),GOMARK(R) ALWAYS TURN ON THE FLASH IF ENTERED WITH A PASTE VERB REQUEST.
R0483       3. ALL NORMAL DISPLAYS ARE RESTARTABLE EXCEPT GODSP(R), REGODSP(R)
R0484       4. ALL EXTENDED VERBS WITH DISPLAYS SHOULD START WITH A TC TESTXACT AND FINISH WITH A TC ENDEXT.
R0486       5. GODSP(R) AND REGODSP(R) MUST BE IN THE SAME EBANK AND SUPERBANK AS THE LAST NORMAL DISPLAY RESTARTED
R0488          BY A .1 RESTART PHASE CHANGE.
R0489       6. IN ORDER TO SET UP A NON DISPLAY .1 RESTART POINT, THE USER MUST MAKE CERTAIN THAT RESTREG CONTAINS THE
R0491          CORRECT PRIORITY AND SUPERBANK AND THAT EBANKTEM CONTAINS THE CO
R0491       7. IF CLEANDSP IS RESTARTED VIA A .1 PHASE CHANGE, CAF ZERO SHOULD BE EXECUTED  BEFORE THE TC BANKCALL.
```

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P0492   CALLING SEQUENCE FOR BLANKING
A0493                                           CAF     BITX            X=1,2,3 BLANK R1,R2,R3 RESPECTIVELY
A0494                                           TC      BLANKET
A0495                                           ...     ...             RETURN TO USER HERE

R0496   IN ORDER TC USE BLANKET CORRECTLY THE USER MUST USE A DISPLAY ROUTINE THAT ENDS IN R FIRST FOLLOWED BY THE CALL
R0498   TC BLANKET AT THE IMMEDIATE RETURN LOC.

 0499                           5415                             BLOCK   02
 0500   REF   1                 4000                             SETLOC  FFTAG4
 0501                           5415                             BANK

 0502   REF   1                                                  COUNT   02/DSPLA

 0503   REF 703  LAST 1413      5415  54 162 C   BLANKET         TS      MPAC +6
 0504   REF   1                 5416  4 0160 1                   CS      PLAYTEM4
 0505   REF 704  LAST 1429      5417  7 0162 C                   MASK    MPAC +6
 0506   REF 705  LAST 1429      5420  50 161 1                   INDEX   MPAC +5
 0507   REF   2  LAST 1429      5421  26 160 1                   ADS     PLAYTEM4

 0508   REF 330  LAST 1415      5422  0 0002 C                   TC      Q

 0511   REF  63  LAST 1406      5423  0 4574 C   ENDMARK         TC      POSTJUMP
 0512   REF   1                 5424   20457 C                   CADR    MARKEND

 05121  REF 265  LAST 1414      5425  3 4714 1   CLEARMRK        CAF     ZERO
 05122  REF  20  LAST  885      5426  55*044 1                   TS      EXTVBACT

 05123                          5427  0 0004 C                   INHINT
 05124  REF  81  LAST 1402      5430  4 4712 C                   CS      BIT1
 05125  REF   9  LAST  383      5431  7 0100 1                   MASK    FLAGWRD4
 05126  REF   6  LAST 1429      5432  54 100 1                   TS      FLAGWRD4

 05127                          5433  0 0003 1                   RELINT
 05128  REF 331  LAST 1429      5434  0 0002 C                   TC      Q
R0513   ***ALL EXTENDED VERB ROUTINES THAT HAVE AT LEAST ONE FLASHING DISPLAY MUST TCF ENDMARK OR TCF ENDEXT WHEN
R0515   FINISHED.

 0516                       10,2457                              BANK    10
 0517   REF   1            10,2000                              SETLOC  DISPLAYS
 0518                      10,2457                              BANK

 0519   REF   1                                                  COUNT   10/DSPLA

R0520   NTEPCNLY IS USED TO DIFFERENTIATE THE MARK ROUTINE WITH ONLY ONE RETURN TO THE USER FROM THE MARKING ROUTINE WIT
R0522   3 RETURNS TO THE USER. THIS ROUTINE IS ONLY USED BY GOMARK1 AND GOMARK1R.

 05291  REF   6  LAST  741  10,2457  0 5425 1  MARKEND         TC      CLEARMRK
 05297  REF   1             10,2460  1 3547 C                   TCF     MARKOVER
```

```
0530   REF   1              10,2461  54 155 1  GOMARK   TS    PLAYTEM1        ENTRANCE FOR MARK GODSP

0531   REF  54  LAST 1413   10,2462  3 4674 0  GOMARS   CAF   BIT15          BIT15 SET FOR ALL MARK REQUESTS
0532   REF   1              10,2463  1 2626 0           TCF   GOFLASH2

0533   REF 266  LAST 1429   10,2464  3 4714 1  KLEENEX  CAF   ZERO           CLEAN OUT EXTENCED VERBS
0534   REF   2  LAST 1430   10,2465  54 155 1  GOMARKF  TS    PLAYTEM1        ENTRANCE FOR MARK GOFLASH

0535   REF   1              10,2466  3 3157 1           CAF   MARKFMSK        MARK,FLASH
0536   REF   2  LAST 1430   10,2467  1 2626 0           TCF   GOFLASH2

0539   REF   3  LAST 1430   10,2470  54 155 1  GOMARK2  TS    PLAYTEM1        MARK GOPERFS-3 AST. RETURNS
0540   REF   1              10,2471  3 3646 0  MARKFORM CAF   MPERFMSK        MARK, PERFORM, FLASH
0541   REF   3  LAST 1430   10,2472  1 2626 0           TCF   GOFLASH2

0542   REF   4  LAST 1430   10,2473  54 155 1  GOMARK3  TS    PLAYTEM1        USED FOR 3COMP DECIMAL PERFORM
0543   REF   1              10,2474  3 3633 1           CAF   MARK3MSK
0544   REF   4  LAST 1430   10,2475  1 2626 0           TCF   GOFLASH2

0545   REF   5  LAST 1430   10,2476  54 155 1  GOMARK4  TS    PLAYTEM1
0546   REF   1              10,2477  3 3634 0           CAF   MARK4MSK        MARK,PERFORM,FLASH,BLANK
0547   REF   5  LAST 1430   10,2500  1 2626 0           TCF   GOFLASH2

0548   REF   6  LAST 1430   10,2501  54 155 1  GOMARKR  TS    PLAYTEM1        ENTR+NCE FOR MARK GODSPR

0549   REF  55  LAST 1430   10,2502  3 4674 0           CAF   BIT15
0550   REF   1              10,2503  1 2604 0           TCF   GODSPR2

0551   REF   7  LAST 1430   10,2504  54 155 1  GOMARKFR TS    PLAYTEM1        ENTRANCE FOR MARK GOFLASHR

0552   REF   2  LAST 1430   10,2505  3 3157 1           CAF   MARKFMSK
0553   REF   1              10,2506  1 2765 0           TCF   GODSPR5

0559   REF   8  LAST 1430   10,2507  54 155 1  GOMARK2R TS    PLAYTEM1        MARK GOPERFS-3 AST. RETS+ IMMEDIATE RET.
0560   REF   2  LAST 1430   10,2510  3 3646 0           CAF   MPERFMSK        MARK, PERFORM, FLASH
0561   REF   2  LAST 1430   10,2511  1 2765 0           TCF   GODSPR5

05611  REF   9  LAST 1430   10,2512  54 155 1  GOMARK3R TS    PLAYTEM1
05612  REF   2  LAST 1430   10,2513  3 3633 1           CAF   MARK3MSK
05613  REF   3  LAST 1430   10,2514  1 2765 0           TCF   GODSPR5

0562   REF 163  LAST 1404   10,2515  3 4712 1  MAKEMARK CAF   ONE
0563   REF   1              10,2516  0 3063 1           TC    COPIES

0564   REF   7  LAST 1429   10,2517  3 0100 0           CA    FLAGWRD4        IS NORM OR PRIO BUSY OR WAITING
0565   REF   1              10,2520  7 3647 0           MASK  OCT34300
0566   REF 388  LAST 1415   10,2521  10 000 0           CCS   A
0567   REF   1              10,2522  1 2560 1           TCF   CHKPRIO

0568   REF   8  LAST 1430   10,2523  3 0100 0           CA    FLAGWRD4        IS MARK SLEEPING DUE TO ASTRO BUSY
```

```
0569   REF  3E  LAST 1407   10,2524  7 4702 1          MASK   BIT9
0570                        10,2525  0 0006 1          EXTEND
0571   REF   1              10,2526  1 2530 1          BZF    MARKPLAY       NO

0572   REF 1C9  LAST 128C   10,2527  1 5112 1          TCF    ENDOFJOB

0594                        10,2530  0 0004 C  MARKPLAY INHINT
0595   REF  28  LAST 1359   10,2531  4 4715 1          CS     FIVE           RESET MARK OVER NORM, SET MARK
0596   REF   9  LAST 143C   10,2532  7 0100 1          MASK   FLAGWRD4
05965  REF 164  LAST 143C   10,2533  6 4712 1          AD     ONE
0597   REF  1C  LAST 1431   10,2534  54 100 1          TS     FLAGWRD4
0598                        10,2535  0 0003 1          RELINT

0599   REF   1              10,2536  4 1070 C  GOGOMARK CS     MARKFLAG       PERFORM
0600   REF  45  LAST 1411   10,2537  7 4706 C          MASK   BIT5
0601   REF 389  LAST 143C   10,2540  1C 000 C          CCS    A
0602   REF   1              10,2541  1 2544 1          TCF    MARKCOP
0603   REF   1              10,2542  4 0370 1          CS     MARKNV
0604   REF   2  LAST 1431   10,2543  54 370 1          TS     MARKNV

0605   REF 169  LAST 1431   10,2544  3 4712 1  MARKCOP CAF    ONE            MARK INDEX
0606   REF   1              10,2545  1 2744 C          TCF    PRIOPLAY

0607   REF   1              10,2546  3 0165 C  COPYTOGO CA     MPAC2SAV
0608   REF 7C6  LAST 1425   10,2547  54 156 1          TS     MPAC +2

0609   REF   1              10,2550  5C 164 1  COPYPACS INDEX  COPINDEX
0610   REF   1              10,2551  3 3657 C          CAF    PRIOCCT
0611   REF   1              10,2552  54 162 C          TS     GENMASK

0612   REF   2  LAST 1431   10,2553  50 164 1          INDEX  COPINDEX
0613   REF   1              10,2554  3 1067 1          CAF    EBANKSAV
0614   REF   1              10,2555  54 160 1          TS     TEMPCR2        ACTIVE EBANK AND FLAG

0615   REF  63  LAST 1406   10,2556  54 003 C          TS     EBANK

0616   REF 332  LAST 1425   10,2557  0 0002 C          TC     Q

R0617  PINCHEK CHECKS TO SEE IF THE CURRENT MARK REQUEST IS MADE BY THE ASTRONAUT WHILE INTERRUPTING A GOPLAY DISPLAY
R0619  (A NORMAL OR A PRIO). IF THE ASTRONAUT TRIES TO MARK DURING A PRIO, THE CHECK FAIL LIGHT GOES ON AND THE MARK
R0621  REQUEST IS ENDED. IF HE TRIES TO MARK DURING A NORM, THE MARK IS ALLOWED. IN THIS CASE THE NORM IS PUT TO SLEEP
R0623  UNTIL ALL MARKING IS FINISHED.

R0624        IF THE MARK REQUEST COMES FROM THE PROGRAM DURING A TIME THE ASTRONAUT IS NOT INTERRUPTING A NORMAL OR A
R0626  PRIO, THE MARK REQUEST IS PUT TO SLEEP UNTIL THE +RESENT ACTIVE DISPLAY IS RESPONDED TO BY THE ASTRONAUT.

0628   REF  11  LAST 1431   10,2560  3 0100 C  CHKPRIO CA     FLAGWRD4       MARK ATTEMPT DURING PRIO
0629   REF   1              10,2561  7 3402 C          MASK   OCT24100
0630   REF 390  LAST 1431   10,2562  1C 000 C          CCS    A
0631   REF   1              10,2563  1 3602 1          TCF    MARSLEEP
```

```
0632   REF  12  LAST 1431   10,2564  4 0100 1            CS      FLAGWRD4
0633   REF  35  LAST 1414   10,2565  7 4710 1            MASK    BIT3          SET MARK OVER NORM
0634                        10,2566  0 0004 0            INHINT
0635   REF  13  LAST 1432   10,2567  26 100 1            ADS     FLAGWRD4

0636   REF   1              10,2570  1 2662 C            TCF     SETNORM

0637   REF   3  LAST 1431   10,2571  3 0370 C  MARKPERF  CA      MARKNV
0638   REF   1              10,2572  7 4160 C            MASK    VERBMASK
0639   REF   1              10,2573  1 3246 C            TCF     NV50DSP

0640   REF  10  LAST 1430   10,2574  54 155 1  GODSP      TS      PLAYTEM1

0641   REF 267  LAST 1430   10,2575  3 4714 1  GODSP2     CAF     ZERO
0642   REF   6  LAST 1430   10,2576  1 2626 C            TCF     GOFLASH2

0643   REF  11  LAST 1432   10,2577  54 155 1  GODSPRET   TS      PLAYTEM1      ENTRANCE FOR A GODSP WITH A PASTE

0644   REF  56  LAST 1402   10,2600  3 4705 1            CAF     BIT6          SET BIT6 TO GO BACK TO USER AFTER NVSUB
0645   REF   7  LAST 1432   10,2601  1 2626 C            TCF     GOFLASH2

0646   REF  12  LAST 1432   10,2602  54 155 1  GODSPR     TS      PLAYTEM1

0647   REF 268  LAST 1432   10,2603  3 4714 1  GODSPR1    CAF     ZERO
0648   REF   3  LAST 1429   10,2604  54 160 1  GODSPR2    TS      PLAYTEM4

0649   REF 269  LAST 1432   10,2605  3 4714 1            CAF     ZERO          * DONT MOVE
0650   REF   1              10,2606  1 2767 1            TCF     GODSPRS1

R0651          CLEANDSP IS USED FOR CLEARING OUT A NORMAL DISPLAY THAT IS PRESENTLY ACTIVE OR A NORMAL DISPLAY THAT IS
R0653   SET UP TO BE STARTED OR RESTARTED.

R0654          NORMALLY THE USER WILL NOT NEED TO USE THIS ROUTINE SINCE A NEW NORMAL DISPLAY AUTOMATICALLY CLEARS OUT AN
R0656   OLD DISPLAY.

R0657          CALLING SEQUENCE FOR CLEANDSP-

A0658                                                  TC      BANKCALL
A0659                                                  CADR    CLEANDSP

0660   REF 270  LAST 1432   10,2607  3 4714 1  CLEANDSP  CAF     ZERO
0661   REF  13  LAST 1432   10,2610  54 155 1  REFLASH    TS      PLAYTEM1

0662   REF   1              10,2611  3 3632 0            CAF     REDOMASK      FLASH AND PERMIT
0663   REF   8  LAST 1432   10,2612  1 2626 C            TCF     GOFLASH2

0664   REF  14  LAST 1432   10,2613  54 155 1  REFLASHR   TS      PLAYTEM1

0665   REF   2  LAST 1432   10,2614  3 3632 0            CAF     REDOMASK      FLASH AND PERMIT
0666   REF   4  LAST 1430   10,2615  1 2765 C            TCF     GODSPRS
```

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0667   REF  15  LAST 1432   10,2616  54 155 1  REGODSP  TS     PLAYTEM1

0668   REF  81  LAST 140C   10,2617  3 4675 1           CAF    BIT14
0669   REF   9  LAST 1432   10,2620  1 2626 C           TCF    GOFLASH2

0670   REF  16  LAST 1433   10,2621  54 155 1  REGODSPR TS     PLAYTEM1

0671   REF  82  LAST 1433   10,2622  3 4675 1           CAF    BIT14
0672   REF   2  LAST 143C   10,2623  1 2604 C           TCF    GODSPR2

0673   REF  17  LAST 1433   10,2624  54 155 1  GOFLASH  TS     PLAYTEM1

0674   REF  52  LAST 1414   10,2625  3 4707 C           CAF    BIT4          LEAVE ONLY FLASH BIT SET
0675   REF   4  LAST 1432   10,2626  54 160 1  GOFLASH2 TS     PLAYTEM4

0676   REF   1              10,2627  0 3050 1           TC     SAVELOCS

0677                        10,2630  0 0003 1           RELINT

0678   REF   1              10,2631  1 2674 1           TCF    MAKEPLAY      BRANCH DIRECT WITH NO SEPARATE JOB CALL

0679   REF  18  LAST 1433   10,2632  54 155 1  PRIODSPR TS     PLAYTEM1

0680   REF   1              10,2633  3 3651 C           CAF    BITS7+4
0681   REF   5  LAST 1432   10,2634  1 2765 C           TCF    GODSPRS

0682   REF  19  LAST 1433   10,2635  54 155 1  PRIODSP  TS     PLAYTEM1

0683   REF   2  LAST 1433   10,2636  3 3651 C  SETPRIO  CAF    BITS7+4
0684   REF  10  LAST 1433   10,2637  1 2626 C           TCF    GOFLASH2

0685   REF 271  LAST 1432   10,2640  3 4714 1  MAKEPRIO CAF    ZERO
0686   REF   3  LAST 1431   10,2641  54 164 C           TS     COPINDEX

0687   REF   1              10,2642  0 3522 1           TC     LINUSCHR
0688   REF   1              10,2643  1 2650 1           TCF    HIPRIO        LINUS RETURN
0689   REF  14  LAST 1432   10,2644  3 0100 C           CA     FLAGWRD4
0690   REF   1              10,2645  7 3670 1           MASK   OCT20100      IS PRIO IN ENDIDLE OR BUSY
0691   REF 391  LAST 1431   10,2646  10 000 C           CCS    A
0692   REF   1              10,2647  1 2723 1           TCF    PRIOBORT      YES, ABORT

0693   REF  15  LAST 1433   10,2650  3 0100 C  HIPRIO   CA     FLAGWRD4      MARK ACTIVE
0694   REF   1              10,2651  7 5612 C           MASK   OCT40400
0695                        10,2652  0 0006 1           EXTEND
0696   REF   1              10,2653  1 2656 1           BZF    ASKIFNRM      NO

0697   REF 272  LAST 1433   10,2654  3 4714 1  SETMARK  CAF    ZERO
0698   REF   1              10,2655  1 3122 1           TCF    JOBXCHS

0699   REF  16  LAST 1433   10,2656  3 0100 C  ASKIFNRM CA     FLAGWRD4      NORMAL ACTIVE
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L DISPLAY INTERFACE ROUTINES USER'S PAGE NO. 19 EO S4

```
0700   REF   1                 10,2657  7 3666 C            MASK   OCT1C200       BITS 13+8
0701                           10,2660  0 0006 1            EXTEND
0702   REF   1                 10,2661  1 2664 C            BZF    OKTOCOPY       NO

0703   REF 166  LAST 1431      10,2662  3 4712 1  SETNORM    CAF    ONE
0704   REF   2  LAST 1433      10,2663  1 3122 1            TCF    JOBXCHS

0705   REF   1                 10,2664  0 3062 C  OKTOCOPY   TC     COPYNORM
0706   REF   1                 10,2665  0 3333 1            TC     WITCHONE

0707   REF   8  LAST 1403      10,2666  0 5074 1            TC     JOBWAKE

0708   REF   1                 10,2667  0 3350 1            TC     XCHTOEND

0709   REF  22  LAST 1386      10,2670  3 0025 C  REDOPRIO   CA     TIME1          SAVE TIME PRIODSP SENT OUT
0710   REF   1                 10,2671  55'147 C            TS     PRIOTIME

0711   REF 273  LAST 1433      10,2672  3 4714 1  KEEPPRIO   CAF    ZERO           START UP PRIO DISPLAY
0712   REF   2  LAST 1431      10,2673  1 2744 C            TCF    PRIOPLAY

0713   REF  28  LAST 1406      10,2674  3 0167 1  MAKEPLAY   CA     PRIORITY       SAVE USERS PRIORITY
07131  REF   3  LAST 1406      10,2675  7 7674 1            MASK   PRIO37
07132  REF   1                 10,2676  54 163 1            TS     USERPRIO
07133  REF   1                 10,2677  3 7670 1            CAF    PRIO33         RAISE PRIORITY FOR FAST JOBS AFTER WAKE
07134  REF  12  LAST  812      10,2700  0 5103 C            TC     PRIOCHNG

07135  REF   5  LAST 1433      10,2701  3 0160 C            CA     PLAYTEM4       IS IT MARK OR PRIO OR NORM
0714   REF   1                 10,2702  7 3650 0            MASK   BITS15+7
0715   REF 392  LAST 1433      10,2703  10 000 C            CCS    A
0716   REF   1                 10,2704  1 2640 0            TCF    MAKEPRIO       ITS PRIO
0717   REF   1                 10,2705  1 2707 1            TCF    IFLEGAL -
0718   REF   1                 10,2706  1 2515 C            TCF    MAKEMARK       ITS MARK

0719   REF  75  LAST 1404      10,2707  3 4711 1  IFLEGAL    CAF    TWO
0720   REF   4  LAST 1433      10,2710  54 164 C            TS     COPINDEX

0721   REF   2  LAST 1433      10,2711  0 3522 1            TC     LINUSCHR

0722   REF   1                 10,2712  1 2725 1            TCF    OKTOPLAY       LINUS RETURN
0723   REF   3  LAST  195      10,2713  4 1071 1            CS     EBANKTEM
0724   REF  53  LAST 1433      10,2714  7 4707 1            MASK   BIT4
0725   REF 393  LAST 1434      10,2715  10 000 C            CCS    A
0726   REF   2  LAST 1434      10,2716  1 2725 1            TCF    OKTOPLAY       NO

0727   REF  17  LAST 1433      10,2717  3 0100 C            CA     FLAGWRD4       WAS NORM ASLEEP
0728   REF   1                 10,2720  7 3641 0            MASK   NBUSMASK       ARE ANY NORMS ASLEEP
0729                           10,2721  0 0006 1            EXTEND
0730   REF   3  LAST 1434      10,2722  1 2725 1            BZF    OKTOPLAY       NO
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0731   REF   7  LAST 1406   10,2723  0 5622 1  PRIOBORT TC     POODCO
0732                        10,2724   01502 1             OCT    1502

0733   REF   1              10,2725  0 3064 C  CKTCPLAY TC     COPIES2

07331  REF   2  LAST 1434   10,2726  3 0163 C            CA     USERPRIO
07332                       10,2727  0 0006 1            EXTEND
07333  REF  24  LAST 1374   10,2730  04 007 1            ROR    SUPERBNK
07334  REF   3  LAST  192   10,2731  54 366 C            TS     RESTREG

0737   REF  18  LAST 1434   10,2732  3 0100 0            CA     FLAGWRD4      PRIO OR MARK GOING
0738   REF   1              10,2733  7 3642 C            MASK   PRIMASK
0739   REF 394  LAST 1434   10,2734  10 000 C            CCS    A
0740   REF   1              10,2735  1 3102 C            TCF    GOSLEEPS      YES

0741                        10,2736  1 2740 1            TCF    +2
0742   REF   2  LAST 1435   10,2737  1 3102 C            TCF    GOSLEEPS      MARK GOING

R0743  COULD PUT NORM BUSY CHECK HERE TO SAVE TIME
0744   REF   2  LAST 1434   10,2740  0 3333 1            TC     WITCHONE      IS IT NVSUB BUSY, ENDIDLE OR NOONE
0745   REF   9  LAST 1434   10,2741  0 5074 1            TC     JOBWAKE

0746   REF   2  LAST 1434   10,2742  0 3350 1            TC     XCHTCEND

0747   REF  76  LAST 1434   10,2743  3 4711 1  PLAYJUM1 CAF    TWO
0748   REF   5  LAST 1434   10,2744  54 164 C  PRIOPLAY TS     COPINDEX

0749   REF   1              10,2745  1 3216 C            TCF    GOPLAY

0750   REF  20  LAST 1433   10,2746  54 155 1  EXOSPRET TS     PLAYTEM1

0751   REF   2  LAST  153   10,2747  3 7703 1            CAF    BIT15+6
0752   REF  11  LAST 1433   10,2750  1 2626 C            TCF    GOFLASH2

0753   REF   2  LAST  712   10,2751  55'045 C  GOPERF1  TS     NORMTEM1      STORE DESIRED CHECKLIST VALUE
0754   REF   1              10,2752  3 3624 1            CAF    V01N25        USED TO DISPLAY CHECKLIST VALUE IN R1

0755   REF  21  LAST 1435   10,2753  54 155 1  GOPERF3  TS     PLAYTEM1

0756   REF   1              10,2754  3 3623 C            CAF    PERFMASK      LEAVE ONLY FLASH, PERFORM, BLANKING
0757   REF  12  LAST 1435   10,2755  1 2626 C            TCF    GOFLASH2

0758   REF  22  LAST 1435   10,2756  54 155 1  GOPERF2  TS     PLAYTEM1      DESIRED VERB-NOUN TO DISPLAY R1,R2,R3

0759   REF   1              10,2757  3 3627 1            CAF    PERF2MSK
0760   REF  13  LAST 1435   10,2760  1 2626 0            TCF    GOFLASH2

0764   REF   1              10,2761  0 3043 C  GOPERF4  TC     PURRS4

0765   REF  14  LAST 1435   10,2762  1 2626 C            TCF    GOFLASH2
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0766   REF  23  LAST 1435   10,2763  54 155 1  GOFLASHR TS      PLAYTEM1

0767   REF  54  LAST 1434   10,2764  3 4707 C           CAF     BIT4          LEAVE ONLY FLASH BIT SET
0768   REF   6  LAST 1434   10,2765  54 160 1  GODSPRS  TS      PLAYTEM4

0769   REF  48  LAST 1395   10,2766  3 6214 C           CAF     THREE

0770                        10,2767  0 0004 C  GODSPRS1 INHINT                IMMEDIATE RETURN IS CALL CADR +4
0771   REF   9  LAST 1403   10,2770  54 072 C           TS      RUPTREG3

0772   REF  29  LAST 1434   10,2771  3 0167 1           CA      PRIORITY      MAKE DISPLAY ONE HIGHER THAN USER
0773   REF   4  LAST 1434   10,2772  7 7674 1           MASK    PRIO37
0774   REF  11  LAST 1184   10,2773  54 063 C           TS      NEWPRIO

07741  REF   7  LAST 1436   10,2774  3 0160 C           CA      PLAYTEM4      IS THIS A FLASHING R DISPLAY
07742  REF  55  LAST 1436   10,2775  7 4707 1           MASK    BIT4
07743  REF 355  LAST 1435   10,2776  10 000 C           CCS     A
07744  REF   1              10,2777  1 3005 C           TCF     VACDSP        YES, MAKE DSPLAY JOB A VAC
07745  REF  12  LAST 1436   10,3000  3 0063 1           CA      NEWPRIO       NO, MAKE DSPLAY JOB A NOVAC
07746  REF  34  LAST 1413   10,3001  0 5027 1           TC      NOVAC
07747  REF   7  LAST  661   E7,1777                     EBANK=  WHOCARES
07748  REF   2  LAST 1433   10,3002   02674 C           2CADR   MAKEPLAY
07748                        10,3003   20107 C
07749  REF   1              10,3004  1 3013 1           TCF     BOTHJOBS

0775   REF  35  LAST 1406   10,3005  3 0006 1  VACDSP   CA      BBANK
0776                        10,3006  0 0006 1           EXTEND
0777   REF  25  LAST 1435   10,3007  04 007 1           ROR     SUPERBNK
0778   REF 226  LAST 1411   10,3010  54 001 1           TS      L
0779   REF   1              10,3011  3 3665 1           CAF     MAKEGEN
0780   REF   3  LAST  409   10,3012  0 5053 1           TC      SPVAC

0781   REF   2  LAST 1433   10,3013  0 3050 1  BOTHJOBS TC      SAVELOCS      COPY TEMPS INTO PERMANENT REGISTERS

0782                        10,3014  0 0006 1           EXTEND                SAVE NVWORD AND USERS MPAC +2
0783   REF 707  LAST 1431   10,3015  3 0156 C           DCA     MPAC +1
0784   REF  25  LAST 1413   10,3016  50 064 C           INDEX   LOCCTR
0785   REF 708  LAST 1436   10,3017  52 156 1           DXCH    MPAC +1

0786                        10,3020  0 0006 1           EXTEND                SAVE USERS CADR, FLAGS AND EBANK
0787   REF 709  LAST 1436   10,3021  3 0160 C           DCA     MPAC +3
0788   REF  26  LAST 1436   10,3022  50 064 C           INDEX   LOCCTR
0789   REF 710  LAST 1436   10,3023  52 160 1           DXCH    MPAC +3

0790   REF  27  LAST 1436   10,3024  3 0064 C           CA      LOCCTR
0791   REF 711  LAST 1436   10,3025  54 161 C           TS      MPAC +5

0792   REF   1              10,3026  0 3055 1           TC      SAVELOCR
0793                        10,3027  0 0003 1           RELINT
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0794   REF   9 LAST 1368   10,3030  1 4577 1           TCF    BANKJUMP        CALL CADR +4

0795   REF   3 LAST 1435   10,3031  55'045 C GOPERF1R  TS     NORMTEM1        DESIRED CHECKLIST VALUE

0796   REF   2 LAST 1435   10,3032  3 3624 1           CAF    V01N25          DISPLAYS CHECKLIST VALUE IN R1

0797   REF  24 LAST 1436   10,3033  54 155 1 GOPERFRS  TS     PLAYTEM1

0798   REF   2 LAST 1435   10,3034  3 3623 C           CAF    PERFMASK        LEAVE ONLY FLASH, PERFORM, BLANKING
0799   REF   6 LAST 1433   10,3035  1 2765 C           TCF    GODSPRS

0800   REF  25 LAST 1437   10,3036  54 155 1 GOPERF2R  TS     PLAYTEM1        DESIRED VERB-NOUN TO DISPLAY R1,R2,R3

0801   REF   2 LAST 1435   10,3037  3 3627 1           CAF    PERF2MSK
0802   REF   7 LAST 1437   10,3040  1 2765 C           TCF    GODSPRS

0806   REF   2 LAST 1435   10,3041  0 3043 C GOPERF4R  TC     PURRS4

0807   REF   8 LAST 1437   10,3042  1 2765 C           TCF    GODSPRS

0808   REF  10 LAST  845   10,3043  55'131 1 PURRS4    TS     OPTION1         DESIRED OPTION CODE

0809   REF   1             10,3044  3 3630 1           CAF    V04N06
0810   REF  26 LAST 1437   10,3045  54 155 1           TS     PLAYTEM1

0811   REF   1             10,3046  3 3631 C           CAF    PERF4MSK        FLASH,PERFORM AND BLANK R3
0812   REF 333 LAST 1431   10,3047  0 0002 C           TC     Q

0813                       10,3050  0 0004 C SAVELOCS  INHINT

0815   REF   1             10,3051  4 3640 1           CS     OCT3400         EBANK BITS
0816   REF   8 LAST 1436   10,3052  7 0160 1           MASK   PLAYTEM4
0817   REF  64 LAST 1431   10,3053  6 0003 1           AD     EBANK
0818   REF   9 LAST 1437   10,3054  54 160 1           TS     PLAYTEM4

0819   REF 334 LAST 1437   10,3055  22 002 C SAVELOCR  LXCH   Q

0820   REF   6 LAST 1405   10,3056  0 4604 1           TC     MAKECADR
0821   REF   1             10,3057  54 157 C           TS     PLAYTEM3

0822   REF  10 LAST 1436   10,3060  6 0072 1           AD     RUPTREG3        NOT USED FOR NON R ROUTINES
0823   REF 227 LAST 1436   10,3061  0 0001 C           TC     L

0824   REF 274 LAST 1434   10,3062  3 4714 1 COPYNORM  CAF    ZERO
0825   REF   6 LAST 1435   10,3063  54 164 C COPIES    TS     COPINDEX
0826                       10,3064  0 0004 C COPIES2   INHINT
0827   REF  10 LAST 1437   10,3065  3 0160 C           CA     PLAYTEM4        FLAGWORD
0828   REF   7 LAST 1437   10,3066  50 164 1           INDEX  COPINDEX
0829   REF   2 LAST 1431   10,3067  55'067 C           TS     EBANKSAV        EQUIV TO OSFFLG
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0830   REF   1                10,3070  7 3656 C            MASK   CADRMASK       FLASH AND GODSPRET
0831                           10,3071  0 0006 1            EXTEND
0832   REF   1                10,3072  1 3076 1            BZF    SKIPADD

0833   REF   2  LAST 1437     10,3073  3 0157 1            CA     PLAYTEM3
0834   REF   8  LAST 1437     10,3074  50 164 1            INDEX  COPINDEX
0835   REF   3  LAST  172     10,3075  54 372 C            TS     CADRFLSH

0836   REF  27  LAST 1437     10,3076  3 0155 C  SKIPADD    CA     PLAYTEM1       VERB NOUN
0837   REF   9  LAST 1438     10,3077  50 164 1            INDEX  COPINDEX
0838   REF   1                10,3100  54 367 1            TS     NVWORD

0842   REF   1                10,3101  1 3357 1            TCF    RELINTC

0843   REF  10  LAST 1438     10,3102  50 164 1  GOSLEEPS  INDEX  COPINDEX
0844   REF   2  LAST 1431     10,3103  3 3657 C            CA     PRIOCCT
0845   REF   1                10,3104  7 3106 1            MASK   WAITMASK
0846   REF   1                10,3105  0 7717 1            TC     UPENT2
0847                           10,3106   03004 C  WAITMASK  OCT    3004
0848   REF 167  LAST 1434     10,3107  4 4712 C            CS     ONE
0849   REF  11  LAST 1438     10,3110  6 0164 1            AD     COPINDEX
0850   REF   1                10,3111  54 154 C            TS     FACEREG

0851   REF   2  LAST 1438     10,3112  50 154 1  XCHSLEEP  INDEX  FACEREG
0852   REF   1                10,3113  3 3636 1            CAF    WAKECADR
0853                           10,3114  0 0004 C            INHINT
0854   REF  10  LAST 1435     10,3115  0 5074 1            TC     JOBWAKE        FIND CADR IN JOB AREA

0855   REF   3  LAST 1435     10,3116  0 3350 1            TC     XCHTCEND       CAUSES AWAKENED JOB TO GO TO ENDOFJOB

0858   REF   3  LAST 1438     10,3117  50 154 1            INDEX  FACEREG        REPLACE SAME CADR BUT NEW JOB AREA
0859   REF   2  LAST 1438     10,3120  3 3636 1            CAF    WAKECADR
0860   REF   7  LAST 1405     10,3121  1 5070 1            TCF    JOBSLEEP

0861   REF   4  LAST 1438     10,3122  54 154 C  JOBXCHS    TS     FACEREG        CONTROLS TYPE OF DISPLAY PUT TO SLEEP
0862   REF   3  LAST 1435     10,3123  0 3333 1            TC     WITCHONE
0863   REF  11  LAST 1438     10,3124  0 5074 1            TC     JOBWAKE
0864   REF   5  LAST 1438     10,3125  3 0154 1            CA     FACEREG
0865   REF  28  LAST 1438     10,3126  50 064 C            INDEX  LOCCTR
0866   REF   6  LAST 1438     10,3127  54 154 C            TS     FACEREG

0867   REF   1                10,3130  3 3143 1            CAF    XCHQADD
0868   REF   1                10,3131  0 3351 C            TC     XCHNYLOC

0869   REF   7  LAST 1438     10,3132  50 154 1            INDEX  FACEREG
0870   REF   1                10,3133  3 3660 1            CA     MARKCCT
0871   REF   1                10,3134  7 3662 1            MASK   IDLESLEP
0872   REF   1                10,3135  0 7735 1            TC     DOWNENT2
0873                           10,3136   74004 C  IDLEMASK  OCT    74004          * DONT MOVE
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0874   REF   8  LAST 1438   10,3137  5C 154 1          INDEX  FACEREG        BIT SHOWS PRIO INTERRUPTED NORM OR MARK
0875   REF  46  LAST 1431   10,3140  3 4706 1          CA     BIT5           BIT5 FOR MARK, BIT4 FOR NORMAL
0876   REF  22  LAST 1397   10,3141  6 4710 C          AD     FOUR
0877   REF   2  LAST 1438   10,3142  0 7717 1          TC     UPENT2         FLAG ROUTINE DOES RELINT
0878   REF   1              10,3143   03112 C  XCHQADD GENADR XCHSLEEP      * DONT MOVE
0879   REF  19  LAST 1435   10,3144  3 0100 C          CA     FLAGWRD4
0880   REF  36  LAST 1432   10,3145  7 4710 1          MASK   BIT3           IF BIT3 THEN MARK OVER NORM
0881   REF 356  LAST 1436   10,3146  10 000 C          CCS    A
0882   REF   2  LAST 1431   10,3147  0 2530 C  GENMARK TC     MARKPLAY       USED AS GENADR FOR JOBWAKE
0883   REF   2  LAST 1434   10,3150  1 2664 C          TCF    OKTOCOPY

0884   REF 275  LAST 1437   10,3151  3 4714 1  MARKWAKE CAF    ZERO
0885   REF   2  LAST 1431   10,3152  54 160 1  WAKEPLAY TS     TEMPCR2

0886   REF   3  LAST 1439   10,3153  5C 160 C          INDEX  TEMPCR2
0887   REF   1              10,3154  3 3652 C          CA     BITS5+11
0888   REF  23  LAST 1439   10,3155  6 4710 C          AD     FOUR
0889   REF   2  LAST 1438   10,3156  0 7735 1          TC     DOWNENT2
0890                        10,3157   40010 1  MARKFMSK OCT    40010          ***DONT MOVE

0891   REF   4  LAST 1439   10,3160  5C 160 C          INDEX  TEMPCR2
0892   REF   3  LAST 1438   10,3161  3 3636 1          CAF    WAKECADR
0893                        10,3162  0 0004 0          INHINT
0894   REF  12  LAST 1438   10,3163  0 5074 1          TC     JOBWAKE

0895   REF   1              10,3164  1 3463 1          TCF    ENDRET

R0896        ALL .1 RESTARTS BRANCH DIRECTLY TO INITDSP. NORMAL DISPLAYS ARE THEONLY DISPLAYS ALLOWED TO USE .1 RESTARTS
R0898  INITDSP FIRST RESTORES THE EBANK AND THE SUPERBANK TO THE MOST RECENT NORMAL EBANK AND SUPERBANK.
R0900        IF THE MOST RECENT NORMAL DISPLAY REQUEST WAS NOT FINISHED, CONTROLIS SENT BACK TO THE LAST NORMAL USER.
R0902  OTHERWISE THE NORMAL DISPLAY SET UP IN THE NORMAL DISPLAY REGS IS STARTED UP IMMEDIATELY.

0904   REF   4  LAST 1434   10,3165  3 1071 C  INITDSP CA     EBANKTEM       RESTORE MOST RECECT NORMAL EBANK
0905   REF  65  LAST 1437   10,3166  54 003 C          TS     EBANK

0906   REF   4  LAST 1435   10,3167  3 0366 1          CA     RESTREG        SUPERBANK AND JOB PRIORITY
0907   REF   1              10,3170  0 4666 C          TC     SUPERSW        RESTORE SUPERBANK

0908   REF   5  LAST 1436   10,3171  7 7674 1          MASK   PRIO37
0909   REF  13  LAST 1434   10,3172  0 5103 C          TC     PRIOCHNG

0910   REF  49  LAST 1436   10,3173  4 6214 1          CS     THREE
0911   REF   4  LAST  610   10,3174  6 0374 1          AD     TEMPFLSH
0912   REF  10  LAST 1437   10,3175  1 4577 1          TCF    BANKJUMP

0913                        10,3176  0 0003 1  PINBRNCH RELINT                FOR GOPIN USERS
09135  REF   1              10,3177  3 1072 C          CA     MARK2PAC       NEEDED TO SAVE MPAC +2 FOR MARK USERS
0914   REF 712  LAST 1436   10,3200  54 156 1          TS     MPAC +2        ONLY

0915   REF  20  LAST 1439   10,3201  3 0100 0          CA     FLAGWRD4       PINBRANCH CONDITION
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0916   REF   1                  10,3202  7 7707 1          MASK    PINMASK
0917   REF 357  LAST 1439       10,3203  10 000 0          CCS     A
0918                            10,3204  1 3207 0          TCF     +3
0919   REF   1                  10,3205  1 3617 0          TCF     ERASER          ** NOTHING IN ENDIDLE
0920   REF   3  LAST 1439       10,3206  1 2530 1          TCF     MARKPLAY

0921   REF  54  LAST 1410       10,3207  0 5435 0  NORMBNCH TC      UPFLAG          SET PINBRANCH BIT
0922   REF   1                  10,3210   00105 0          ADRES   PINBRFLG

0923   REF  83  LAST 1433       10,3211  3 4675 1          CAF     BIT14           PRIO INTERRUPTED
0924   REF  21  LAST 1439       10,3212  7 0100 1          MASK    FLAGWRD4
0925   REF 398  LAST 1440       10,3213  10 000 0          CCS     A
0926   REF   1                  10,3214  1 2672 1          TCF     KEEPPRIO

0927   REF   1                  10,3215  1 2743 1          TCF     PLAYJUM1

0928   REF   1                  10,3216  0 2550 0  NVDSP    TC      COPYPACS

09281  REF   5  LAST 1439       10,3217  3 0160 0          CA      TEMPOR2         SET UP BLANK BITS FOR NVMONOPT IN CASE
09282  REF  23  LAST 1406       10,3220  7 4716 1          MASK    SEVEN           USER REQUESTS BLANKING MONITOR
09283  REF 228  LAST 1437       10,3221  54 001 1          TS      L

0929   REF  51  LAST 1407       10,3222  4 4676 0          CS      BIT13
0930   REF  12  LAST 1438       10,3223  50 164 1          INDEX   COPINDEX
0931   REF   1                  10,3224  7 1067 0          MASK    DSPFLG
0932   REF  13  LAST 1440       10,3225  50 164 1          INDEX   COPINDEX
0933   REF   2  LAST 1440       10,3226  55'067 0          TS      DSPFLG

0934   REF  32  LAST 1406       10,3227  7 4703 0          MASK    BIT8            BIT8 SET IF DEC MARK PERFORM DISPLAY
0935   REF   5  LAST 1142       10,3230  54 141 1          TS      TEM1

0936   REF 713  LAST 1439       10,3231  3 0156 0          CA      MPAC +2
0937   REF   2  LAST 1431       10,3232  54 165 1          TS      MPAC2SAV

0938   REF   2  LAST 1439       10,3233  55'072 1          TS      MARK2PAC        * FOR DISK ONLY *
0939   REF  14  LAST 1440       10,3234  50 164 1          INDEX   COPINDEX
0940   REF   2  LAST 1438       10,3235  10 367 1          CCS     NVWORD
0941   REF   1                  10,3236  1 3245 0          TCF     NVDSP1
0942   REF   1                  10,3237  1 3361 1          TCF     CLEANEND
0943   REF   4  LAST 1432       10,3240  4 0370 1          CS      MARKNV
0944   REF   5  LAST 1440       10,3241  54 370 1          TS      MARKNV          IN CASE MARKPLAY AWAKENED AFTER SLEEPING
0945   REF  12  LAST 1401       10,3242  7 6043 1          MASK    LOW7
0946   REF   1                  10,3243  6 3643 0          AD      VOSNOOM1
0947   REF   6  LAST 1440       10,3244  6 0141 0          AD      TEM1
0948   REF 168  LAST 1438       10,3245  6 4712 1  NVDSP1   AD      ONE
0949   REF   1                  10,3246  0 4171 1  NV50DSP  TC      NVMONOPT
0950   REF   1                  10,3247  1 3373 1          TCF     REST            IF BUSY
0951   REF   6  LAST  378       10,3250  0 4447 1          TC      FLASHOFF        IN CASE OF EXTENDED VERB NON FLASH

0952   REF   1                  10,3251  0 2546 1          TC      COPYTOGO        MPACS DESTROYED BY NVSUB
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0953   REF  58  LAST 1412   10,3252  0 5447 C            TC      DOWNFLAG        UNSET SLEEPING BITS
0954   REF   1              10,3253   00102 1            ADRES   MRKNVFLG
09541  REF  59  LAST 1441   10,3254  0 5447 C            TC      DOWNFLAG
09542  REF   1              10,3255   00103 C            ADRES   NRMNVFLG
09543  REF  60  LAST 1441   10,3256  0 5447 C            TC      DOWNFLAG
09544  REF   1              10,3257   00104 1            ADRES   PRONVFLG
0955   REF   6  LAST 1440   10,3260  3 0160 C  BLANKCHK CA      TEMPCR2         BLANK BITS 1,2,3 IF SET
0956   REF   2  LAST  349   10,3261  0 4271 1            TC      BLANKSUB
0957   REF   1              10,3262  1 3216 C            TCF     NVDSP
0958   REF  47  LAST 1439   10,3263  3 4706 1  PERFCHEK CAF     BIT5            BIT 5 FOR PERFORM
0959   REF   7  LAST 1441   10,3264  7 0160 1            MASK    TEMPCR2
0960   REF 359  LAST 144C   10,3265  10 000 C            CCS     A               IS THIS A GOPERF DISPLAY
0961   REF   1              10,3266  1 3311 C            TCF     1STCR2ND        YES

0962   REF  56  LAST 1436   10,3267  3 4707 C  GOANIDLE CAF     BIT4
0963   REF   8  LAST 1441   10,3270  7 0160 1            MASK    TEMPCR2
0964   REF 4CC  LAST 1441   10,3271  10 000 C            CCS     A
0965   REF   1              10,3272  1 3406 1            TCF     FLASHSUB        IT IS

0966   REF   9  LAST 1441   10,3273  4 0160 1            CS      TEMPCR2         IS THIS A GODSPRET
0967   REF  57  LAST 1432   10,3274  7 4705 C            MASK    BIT6
0968   REF 401  LAST 1441   10,3275  10 000 C            CCS     A
0969   REF   1              10,3276  1 3303 C            TCF     ISITNOO

09691  REF  15  LAST 144C   10,3277  5C 164 1            INDEX   COPINDEX
09692  REF   4  LAST 143E   10,3300  3 0372 1            CA      CADRFLSH
09693  REF 714  LAST 144C   10,3301  54 157 C            TS      MPAC +3
09694  REF   1              10,3302  1 3501 1            TCF     ENDIT

0972   REF  16  LAST 1441   10,3303  5C 164 1  ISITNOO  INDEX   COPINDEX        IS THIS A PASTE
0973   REF   3  LAST 144C   10,3304  3 0367 C            CA      NVWORD
0974   REF  13  LAST 144C   10,3305  7 6043 1            MASK    LOW7            CHECK MADE FOR PINBRNCH AND PRIO ON MARK
0975                        10,3306  0 0006 1            EXTEND
0976   REF   2  LAST 1441   10,3307  1 3406 1            BZF     FLASHSUB        YES, ASSUME PASTE ALWAYS ON FLASH

0977   REF 110  LAST 1431   10,3310  1 5112 1            TCF     ENDOFJOB        NOT FLASH, NOT GOPERF, THERFORE EXIT

0978   REF  10  LAST 1441   10,3311  3 0160 C  1STCR2ND CA      TEMPCR2
0979   REF  52  LAST 144C   10,3312  7 4676 C            MASK    BIT13
0980   REF 402  LAST 1441   10,3313  10 000 C            CCS     A
0981   REF   1              10,3314  1 3267 C            TCF     GOANIDLE        SECOND

0982   REF  53  LAST 1441   10,3315  3 4676 1            CA      BIT13
0983   REF  17  LAST 1441   10,3316  5C 164 1            INDEX   COPINDEX
0984   REF   3  LAST 144C   10,3317  27*067 C            AOS     DSPFLG

09845                       10,3320  22 007 C            ZL
0985                        10,3321  0 0006 1            EXTEND          IS IT MARK
0986   REF   1              10,3322  6 2571 C            BZMF    MARKPERF        YES
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0987   REF  35  LAST 1377   10,3323   7 4677 1          MASK   BIT12
09871                       10,3324   0 0006 1          EXTEND
09872  REF   1               10,3325   1 3331 1          BZF    V50PASTE
09874  REF  20  LAST  675    10,3326   4 1145 1          CS     NVWORD1        NVOWRD1= -0 IS V97. NVWORD1= -400 IS V99
098741 REF   1               10,3327   6 3667 C          AD     V97N00
09875  REF   2  LAST 1432   10,3330   1 3246 C          TCF    NV50DSP
0988   REF   1               10,3331   3 3626 C  V50PASTE CAF    V50N00
0989   REF   3  LAST 1442   10,3332   1 3246 C          TCF    NV50DSP        DISPLAY SECOND PART OF GOPERF

0990   REF  48  LAST 1441   10,3333   4 4706 C  WITCHONE CS     BIT5           TURN OFF KEY RELEASE LIGHT
0991                        10,3334   0 0006 1          EXTEND
0992   REF  35  LAST 1414   10,3335   03 011 1          WAND   DSALMOUT

0993   REF  22  LAST 1440   10,3336   3 0100 C          CA     FLAGWRD4
0994   REF   1               10,3337   7 3644 C          MASK   NVBUSMSK       IS IT NVSUB ASLEEP
0995   REF 403  LAST 1441   10,3340   10 000 C          CCS    A
0996   REF 169  LAST 1440   10,3341   3 4712 1          CAF    ONE
0997   REF 229  LAST 1440   10,3342   54 001 1          TS     L
0998   REF 276  LAST 1439   10,3343   3 4714 1          CAF    ZERO
0999   REF 230  LAST 1442   10,3344   50 001 C          INDEX  L
1000   REF  11  LAST  368   10,3345   57*042 C          XCH    CADRSTOR

1001                        10,3346   0 0004 C          INHINT
1002   REF 335  LAST 1437   10,3347   0 0002 C          TC     Q

1003   REF   6  LAST  358   10,3350   3 4233 1  XCHTOEND CAF    ENDINST        TC ENDOFJOB REPLACES GENADR IN LOC FOR
1004   REF  29  LAST 1438   10,3351   56 064 C  XCHNYLOC XCH    LOCCTR         WAS THIS ADDRESS SLEEPING
1005                        10,3352   0 0006 1          EXTEND
1006   REF   2  LAST 1438   10,3353   6 3357 C          BZMF   RELINTQ        NO
1007   REF  30  LAST 1442   10,3354   56 064 C          XCH    LOCCTR         YES
1008   REF  31  LAST 1442   10,3355   50 064 C          INDEX  LOCCTR
1009   REF  42  LAST 1403   10,3356   54 164 C          TS     LOC

1010                        10,3357   0 0003 1  RELINTQ  RELINT
1011   REF 336  LAST 1442   10,3360   0 0002 C          TC     Q              BACK TO USER

1012   REF   5  LAST  774   10,3361   3 7667 1  CLEANEND CAF    PRIO32         ONE LOWER THAN DISPLAYS SLEEPING
1014   REF  33  LAST 1383   10,3362   0 5042 1          TC     FINDVAC
1015   REF   2  LAST  178      0371                     EBANK= NVSAVE
1016   REF   1               10,3363    04245 C        2CADR  JAMTERM
1016   REF   1               10,3364    04100 1

1017   REF   3  LAST 1441   10,3365   1 3407 C          TCF    FLASHSUB +1

1018   REF  23  LAST 1442   10,3366   3 0100 C  ISITPRIO CA     FLAGWRD4
1019   REF   1               10,3367   7 3414 1          MASK   ITISMASK       IS PINBRFLG, MARKIDFLG SET
1020                        10,3370   0 0006 1          EXTEND
1021   REF   2  LAST 1433   10,3371   1 2723 1          BZF    PRIOBORT
1022   REF 111  LAST 1441   10,3372   1 5112 1          TCF    ENDOFJOB
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1023   REF  12  LAST 1442   10,3373  11'042 1  REST      CCS     CADRSTOR        IS SOMEONE IN ENDIDLE
1024   REF 112  LAST 1442   10,3374  1 5112 1             TCF     ENDOFJOB        YES
1025   REF   1              10,3375  1 3377 0             TCF     RESTSLEP

1026   REF 113  LAST 1443   10,3376  1 5112 1             TCF     ENDOFJOB

1027   REF   2  LAST 1431   10,3377  3 0162 1  RESTSLEP  CA      GENMASK         SET NVSLEEP BITS
1028   REF   1              10,3400  7 3645 1             MASK    ASTROMSK
1029   REF   3  LAST 1439   10,3401  0 7717 1             TC      UPENT2
1030                        10,3402   24100 0  OCT24100  OCT     24100           *** DONT MOVE

1031   REF  18  LAST 1441   10,3403  50 164 1             INDEX   COPINDEX
1032   REF   1              10,3404  3 3635 1             CAF     NVCADR
1033   REF   2  LAST  374   10,3405  0 4456 1             TC      NVSUBUSY        BUSY OR ABORT IF ILLEGAL

1034   REF   4  LAST  357   10,3406  0 4443 0  FLASHSUB  TC      FLASHON

1035   REF  19  LAST 1443   10,3407  3 0164 1             CA      COPINDEX        COPINDEX DESTROYED BY ENDIDLE
1036   REF   1              10,3410  54 157 0             TS      COPMPAC

1037   REF   3  LAST 1443   10,3411  3 0162 1             CA      GENMASK
1038   REF   1              10,3412  7 3136 1             MASK    IDLEMASK
1039   REF   4  LAST 1443   10,3413  0 7717 1             TC      UPENT2
1040                        10,3414   40040 1  ITISMASK  OCT     40040           *** ENDIDLE ALLOW *** DONT MOVE

1041   REF   2  LAST  187   10,3415  3 1073 1             CA      RISAVE          IS THIS A REPEAT AND RETURN DISPLAY
1042   REF  20  LAST 1443   10,3416  50 164 1             INDEX   COPINDEX
1043   REF  37  LAST 1439   10,3417  7 4710 1             MASK    BIT3
1044   REF 404  LAST 1442   10,3420  10 000 0             CCS     A
1045   REF   1              10,3421  1 3506 0             TCF     UNSETRI         YES

1046   REF  13  LAST 1443   10,3422  11'042 1             CCS     CADRSTOR        SEE IF SOMEONE ALREADY IN ENDIDLE
1047   REF   1              10,3423  1 3366 0             TCF     ISITPRIO
1048                        10,3424  1 3426 0             TCF     +2
1049   REF   2  LAST 1443   10,3425  1 3366 0             TCF     ISITPRIO

1050   REF   1              10,3426  0 4223 0             TC      ENDIDLE
1051   REF   1              10,3427  1 3520 1  IDLERET1  TCF     TERMATE

1052   REF   1              10,3430  1 3537 1             TCF     PROCEED         ENDIDLE RETURNS HERE ON PROCEED

1053   REF   1              10,3431  4 3654 1             CS      LOWLOAD
1054   REF 715  LAST 1441   10,3432  6 0154 1             AD      MPAC            VERBREG
1055                        10,3433  0 0006 1             EXTEND
1056   REF 405  LAST 1443   10,3434  26 000 0             DIM     A
1057                        10,3435  0 0006 1             EXTEND
1058   REF   1              10,3436  1 3607 1             BZF     LOADITIS        V21 OR V22 OR V23 ON DSKY
1059   REF  77  LAST 1435   10,3437  3 4711 1  OKTCENT   CAF     TWO
1060   REF   1              10,3440  54 161 0  ENDOUT    TS      OUTHERE
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1061  REF  24  LAST 1442  10,3441  3 0100 C            CA    FLAGWRD4   CHECK NATURE OF ENDIDLE RETURN
1062  REF  14  LAST 1375  10,3442  7 4105 C            MASK  OCT6C000
1063  REF 4CC  LAST 1443  10,3443  1C 000 C           CCS   A
1064  REF   1             10,3444  1 3447 1            TCF   TIMECHEK   PRIO ENDIDLE RETURN
1065  REF   1             10,3445  1 3555 C            TCF   NORMRET    NORMAL ENDIDLE RETURN
1066  REF   1             10,3446  1 3541 C            TCF   MARKRET    MARK ENDIDLE RETURN

1067  REF  23  LAST 1434  10,3447  4 0025 1  TIMECHEK CS    TIME1
1068  REF   2  LAST 1434  10,3450  6 1147 1            AD    PRIOTIME
1069  REF 4C7  LAST 1444  10,3451  1C 000 C           CCS   A
1070                      10,3452  4 0000 C            COM
1071  REF   5  LAST 138C  10,3453  6 7700 1            AD    OCT37776
1072  REF 17C  LAST 1442  10,3454  6 4712 1            AD    ONE
1073  REF   1             10,3455  6 3677 1            AD    -2SEC
1074                      10,3456  0 0006 1            EXTEND
1075  REF   2  LAST 144C  10,3457  6 2672 0            BZMF  KEEPPRIO

1076  REF   2  LAST 1444  10,3460  1 3555 C            TCF   NORMRET

1084  REF 171  LAST 1444  10,3461  3 4712 1  NORMWAKE CAF   ONE
1085  REF   1             10,3462  1 3152 C            TCF   WAKEPLAY

1086  REF   2  LAST 1443  10,3463  10 161 C  ENDRET   CCS   OUTHERE
1087  REF 172  LAST 1444  10,3464  6 4712 1            AD    ONE
1088                      10,3465  1 3467 0            TCF   +2         NORMAL ENDIDLE EXIT
1089  REF 114  LAST 1443  10,3466  1 5112 1            TCF   ENDOFJOB
1090  REF   2  LAST 1443  10,3467  5C 157 1           INDEX COPMPAC
1091  REF   5  LAST 1441  10,3470  6 0372 1            AD    CADRFLSH
1092  REF 716  LAST 1443  10,3471  54 157 C           TS    MPAC +3

1093  REF   4  LAST 1443  10,3472  3 0162 1            CA    GENMASK    REMOVE ENDIDLE AND PINBRANCH BITS
1094  REF   1             10,3473  7 3475 C            MASK  PINIDMSK
1095  REF   3  LAST 1439  10,3474  0 7735 1            TC    DOWNENT2
1096                      10,3475   74044 1  PINIDMSK OCT   74044      *** DONT MOVE

1097  REF  5C  LAST 1439  10,3476  4 6214 1            CS    THREE      BLANK EVERYTHING EXCEPT MM
1098  REF   2  LAST  23C  10,3477  0 4170 C            TC    NVSUB
1099                      10,3500  1 3501 1            TCF   +1

1100  REF   3  LAST 1435  10,3501  3 0163 C  ENDIT    CA    USERPRIO   RETURN TO USERS PRIORITY
1101  REF   6  LAST 1439  10,3502  7 7674 1            MASK  PRIO37
1102  REF  14  LAST 1439  10,3503  0 5103 C            TC    PRIOCHNG
1103  REF 717  LAST 1444  10,3504  3 0157 1            CA    MPAC +3
1104  REF  11  LAST 1439  10,3505  1 4577 1            TCF   BANKJUMP

1105  REF  21  LAST 1443  10,3506  5C 164 1  UNSETRI  INDEX  COPINDEX   RESET REPEAT AND RETURN REQUEST
1106  REF  38  LAST 1443  10,3507  4 4710 1            CS    BIT3
1107  REF   3  LAST 1443  10,3510  7 1073 C            MASK  RISAVE
1108  REF   4  LAST 1444  10,3511  55'073 C           TS    RISAVE
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1109  REF 277  LAST 1442   10,3512  3 4714 1          CAF     ZERO        *** 205 ONLY MARKBRAN USERS IN
1110  REF   2  LAST 1439   10,3513  0 4666 0          TC      SUPERSW     SUPERBANK 0

1111  REF  51  LAST 1444   10,3514  3 6214 0  -1      CAF     THREE       RETURN TO USERS IMMEDIATE RETURN LOC
1112  REF  22  LAST 1444   10,3515  5C 164 1  IMMEDRET INDEX  COPINDEX
1113  REF   6  LAST 1444   10,3516  6 0372 1          AD      CADRFLSH
1114  REF  12  LAST 1444   10,3517  1 4577 1          TCF     BANKJUMP

1115  REF 278  LAST 1445   10,3520  3 4714 1  TERMATE CAF     ZERO        ASTRONAUT TERMINATE (V34) RETURNS TO
1116  REF   1               10,3521  1 3440 0          TCF     ENDOUT

1117  REF  11  LAST 1437   10,3522  4 0160 1  LINUSCHR CS     PLAYTEM4    IS THIS A LINUS
1118  REF  84  LAST 1440   10,3523  7 4675 0          MASK    BIT14
1119  REF 4C8  LAST 1444   10,3524  1C 000 0          CCS     A
1120  REF   4  LAST 1368   10,3525  1 6706 1          TCF     Q+1         NO
1121  REF   3  LAST 1438   10,3526  4 0157 0          CS      PLAYTEM3    YES, IS IT ALREADY IN ENDIDLE
1122  REF  23  LAST 1445   10,3527  5C 164 1          INDEX   COPINDEX
1123  REF   7  LAST 1445   10,3530  6 0372 1          AD      CADRFLSH
1124                       10,3531  0 0006 1          EXTEND
1125                       10,3532  1 3534 1          BZF     +2          YES

1126  REF 337  LAST 1442   10,3533  0 0002 0          TC      Q           NO
1127  REF  12  LAST  379   10,3534  11'012 1          CCS     DSPLCCK     IS THE ASTRONAUT BUSY
1128  REF 115  LAST 1444   10,3535  0 5112 0          TC      ENDOFJOB    END THE NEW DISPLAY, ITS ALREADY ACTIVE
1129  REF 338  LAST 1445   10,3536  0 0002 0          TC      Q

R1130  MORE LOGIC COULD BE INCORPORATED HERE TO MAKE SURE A RECYCLE IS A RECYCLAND CONVERSLY THAT A LOAD IS A LOAD.
1132  REF 173  LAST 1444   10,3537  3 4712 1  PROCEED CAF     ONE                 ASTRONAUT PROCEED (V33) RETURNS
1133  REF   2  LAST 1445   10,3540  1 3440 0          TCF     ENDOUT

R1138       LASTPLAY CHECKS TO SEE IF (1) THE LAST NORMAL DISPLAY WAS EITHER INTERRUPTED BY A PRIO OR A MARK (MARK
R1140  COULD ONLY HAPPEN DURING PINBRANCH) OR IF (2) THE LAST NORMAL DISPLAY WAS REQUESTED WHILE A HIGHER PRIORITY
R1142  DISPLAY WAS GOING RESULTING IN THE NORMAL BEING PUT TO SLEEP.

R1143       IF EITHER OF THE ABOVE 2 CONDITIONS EXISTS , THE NORMAL DISPLAY IS AWAKENED TO GO TO PLAYJUMI WHICH STARTS
R1145  UP THE MOST RECENT VALID NORMAL DISPLAY. IF THESE 2 CONDITIONS DO NOT EXIST, CONTROL GOES TO PLAYJUMI WHICH IS
R1147  STARTED IMMEDIATELY WITH THE ASSUMPTION THAT THE MOST RECENT NORMAL DISPLAY IS ALREADY IN-ENDIDLE(DURING A
R1149  PINBRANCH) OR THAT A RESTART HAS OCCURRED AND THE DISPLAY CAN BE STARTED AS A .1 RESTART.

1163  REF  42  LAST 1387   10,3541  4 6211 1  MARKRET CS     SIX
1164  REF  25  LAST 1444   10,3542  7 0100 1          MASK    FLAGWRD4
1165                       10,3543  0 0004 0          INHINT              *** MAY MOVE DISPLAY FLAGWORD OUT OF
1166  REF  26  LAST 1445   10,3544  54 100 1          TS      FLAGWRD4

1167                       10,3545  0 0003 1          RELINT              INHINT REALM
1168  REF   2  LAST 1439   10,3546  1 3463 1          TCF     ENDRET

1169  REF   2  LAST 1398   10,3547  3 7716 0  MARKOVER CAF    MINUS1      RUPTREG2 IS - MEANS ENDOFJOB TO ENDRET
1170  REF   3  LAST 1444   10,3550  54 161 0          TS      OUTHERE
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1171   REF  27  LAST 1445   10,3551  3 0100 0          CA      FLAGWRD4        IS ENDIDFLG SET
1172   REF  16  LAST 1368   10,3552  7 4371 1          MASK    PRIO30          IS NORMAL OR PRIO IN ENDIDLE
1173   REF 409  LAST 1445   10,3553  10 000 0          CCS     A
1174   REF   1              10,3554  1 3207 0          TCF     NORMBNCH

1175   REF  28  LAST 1446   10,3555  3 0100 0 NORMRET  CA      FLAGWRD4        IS MARK SLEEPING
1176   REF   2  LAST 1439   10,3556  7 3652 1          MASK    BITS5+11        OR WAITING
1177   REF 410  LAST 1446   10,3557  10 000 0          CCS     A
1178   REF   1              10,3560  1 3151 0          TCF     MARKWAKE

1179   REF  29  LAST 1446   10,3561  3 0100 0          CA      FLAGWRD4        NO
1180   REF   1              10,3562  7 3653 0          MASK    BITS4+10        IS NORMAL INTERRUPTED OR WAITING
1181   REF 411  LAST 1446   10,3563  10 000 0          CCS     A
1182   REF   1              10,3564  1 3461 0          TCF     NORMWAKE        YES

1183   REF   5  LAST 1439   10,3565  3 1071 0          CA      EBANKTEM        NO, WAS IT A FLASH REQUEST
1184   REF   6  LAST 1406   10,3566  7 4726 1          MASK    OCT50           OR A GODSPRET
1185   REF 412  LAST 1446   10,3567  10 000 0          CCS     A
1186   REF   3  LAST 1445   10,3570  1 3463 1          TCF     ENDRET          YES
1187   REF   3  LAST 1442   10,3571  3 0371 1          CA      NVSAVE
1188                        10,3572  0 0006 1          EXTEND
1189   REF   4  LAST 1446   10,3573  1 3463 1          BZF     ENDRET

1190   REF   4  LAST  645   10,3574  3 4762 0          CAF     PRIO15
1191                        10,3575  0 0004 0          INHINT
1192   REF  35  LAST 1436   10,3576  0 5027 1          TC      NOVAC
1193   REF   4  LAST 1441      0367                    EBANK=  NVWORD
1194   REF   2  LAST 1440   10,3577   02743 0          2CADR   PLAYJUM1
1194                        10,3600   20100 1

1195   REF   5  LAST 1446   10,3601  1 3463 1          TCF     ENDRET

1196   REF  30  LAST 1446   10,3602  3 0100 0 MARSLEEP CA      FLAGWRD4        IS MARK ALREADY IN
1197   REF   3  LAST 1446   10,3603  7 3652 1          MASK    BITS5+11
1198   REF 413  LAST 1446   10,3604  10 000 0          CCS     A
1199   REF 116  LAST 1445   10,3605  1 5112 1          TCF     ENDOFJOB        YES
11991  REF   3  LAST 1435   10,3606  1 3102 0          TCF     GOSLEEPS

1200   REF   3  LAST 1444   10,3607  50 157 1 LOADITIS INDEX   COPMPAC
1201   REF   5  LAST 1446   10,3610  3 0367 0          CA      NVWORD
1202   REF  14  LAST 1441   10,3611  7 6043 1          MASK    LOW7
1203                        10,3612  4 0000 0          COM
1204   REF 718  LAST 1444   10,3613  6 0155 0          AD      MPAC +1         NOUNREG
1205                        10,3614  0 0006 1          EXTEND
1206   REF   1              10,3615  1 3437 0          BZF     OKTOENT         NO, THEN LOAD IS VALID
1207   REF   6  LAST  445   10,3616  1 3176 0          TCF     PINBRNCH        YES, ACCEPT LOAD BUT ASK FOR LAST AGAIN

1208   REF  52  LAST 1445   10,3617  4 6214 1 ERASER   CS      THREE           BLANK EVERYTHINGEXCEPT MM
1209   REF   3  LAST 1444   10,3620  0 4170 0          TC      NVSUB
1210   REF 117  LAST 1446   10,3621  1 5112 1          TCF     ENDOFJOB
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1211   REF 118  LAST 1446   10,3622  1 5112 1            TCF     ENDOFJOB

1212                        10,3623   00036 1  PERFMASK  OCT     0036          FLASH,PERFORM,BLANK R2 AND R3
1213                        10,3624   00231 1  V01N25    VN      00125
1214                        10,3625   01407 0  V06N07    VN      00607         GOPERF3 VN DISPLAY BEFORE V50
1215                        10,3626   14400 0  V50N00    VN      5000
1216                        10,3627   00030 1  PERF2MSK  OCT     00030         FLASH, PERFORM
1217                        10,3630   01006 0  V04N06    VN      00406
1218                        10,3631   00014 1  PERF4MSK  OCT     14            FLASH, BLANK R3
1219   REF   7  LAST 1446   10,3176            GOAGIN    EQUALS  PINBRNCH
1220                        10,3632   20010 1  REDOMASK  OCT     20010         BITS 4 AND 14
1221                        10,3633   40230 1  MARK3MSK  OCT     40230         MARK,DECIMAL NOUN, PERFORM,FLASH
1222                        10,3634   40036 0  MARK4MSK  OCT     40036         MARK,PERFORM,FLASH,BLANK 2 AND 3
1223   REF   1              10,3635   20670 1  NVCADR    CADR    REDOPRIO
1224   REF   4  LAST 1440   10,3636   20530 0  WAKECADR  CADR    MARKPLAY
1225   REF   3  LAST 1446   10,3637   20743 0            CADR    PLAYJUM1

1226                        10,3640   03400 0  OCT3400   OCT     3400          EBANK MASK
1227                        10,3641   11210 1  NBUSMASK  OCT     11210
1228                        10,3642   66521 1  PMMASK    OCT     66521
1229   REF   4  LAST  356     4160             VERBMASK  =       MID7          (OCT 37600)
1230                        10,3643   01177 1  V05N00M1  OCT     1177          V05 MINUS ONE
1231   REF   1              10,2461            GOXDSP    EQUALS  GOMARK
1232   REF   1              10,2501            GOXDSPR   EQUALS  GOMARKR
1233   REF   9  LAST  888   10,2465            GOXDSPF   EQUALS  GOMARKF
1234   REF   5  LAST  888   10,2504            GOXDSPFR  EQUALS  GOMARKFR
1235   REF   4  LAST  561      5423            ENDEXT    EQUALS  ENDMARK
1236   REF  14  LAST 1183      0165            MPAC2SAV  EQUALS  BANKSET
1238                        10,3644   00700 0  NVBUSMSK  OCT     700
12385                       10,3645   00704 1  ASTROMSK  OCT     704
1239                        10,3646   40030 0  MPERFMSK  OCT     40030         BIT 15,5,4 FOR MARK,PERFORM,FLASH
1240                        10,3647   34300 0  OCT34300  OCT     34300
1241                        10,3650   40100 1  BITS15+7  OCT     40100
1242                        10,3651   00110 1  BITS7+4   OCT     110
1243   REF   3  LAST 1437      1067            DSPFLG    EQUALS  EBANKSAV
1244   REF   1                 1070            MARKFLAG  EQUALS  MARKEBAN
1245   REF   6  LAST 1446      1071            SAVEFLAG  EQUALS  EBANKTEM
1246                        10,3652   02020 1  BITS5+11  OCT     2020          * DONT MOVE
1247                        10,3653   01010 1  BITS4+10  OCT      1010         * DONT MOVE
1249                        10,3654   00026 0  LOWLOAD   DEC     22
1250                        10,3655   77730 0  BUSYMASK  OCT     7773
1252                        10,3656   00050 1  CADRMASK  OCT     50
1253   REF   7  LAST 1389      7707            PINMASK   EQUALS  13,14,15
1254   REF   2  LAST 1441   10,3216            GOPLAY    EQUALS  NVDSP
A1255                                         PRIOSAVE  EQUALS  R1SAVE
1256   REF 719  LAST 1446      0157            COPMPAC   EQUALS  MPAC +3
1257   REF 720  LAST 1447      0160            TEMPOR2   EQUALS  MPAC +4
1258   REF 721  LAST 1447      0161            OUTHERE   EQUALS  MPAC +5
1259   REF  43  LAST 1442      0164            COPINDEX  EQUALS  LOC
1260   REF  26  LAST 1149      0163            USERPRIO  EQUALS  MODE
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L DISPLAY INTERFACE ROUTINES USER'S PAGE NO. 33 EQ 54

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1261  REF 722  LAST 1447     0162            GENMASK  EQUALS MPAC +6
1262                      10,3657  20144 1    PRICOCT  OCT    20144        PRIO
1263                      10,3660  42424 0    MARKOCT  OCT    42424        MARK
1264                      10,3661  11254 1               OCT    11254        NORM

1265                      10,3662  74704 1    IDLESLEP OCT    74704
1266                      10,3663  67777 1    OCT67777 OCT    67777
1267  REF  18  LAST  888     5415            LINUS    EQUALS BLANKET
1268  REF 723  LAST 1448     0154            FACEREG  EQUALS MPAC
1269  REF 724  LAST 1448     0155            PLAYTEM1 EQUALS MPAC +1
1270  REF 725  LAST 1448     0157            PLAYTEM3 EQUALS MPAC +3
1271  REF 726  LAST 1448     0160            PLAYTEM4 EQUALS MPAC +4
1273                      10,3664  40420 0    OCT40420 OCT    40420
1274  REF   3  LAST 1436  10,3665  02674 0    MAKEGEN  GENADR MAKEPLAY
1275                      10,3666  10200 1    OCT10200 OCT    10200
1276                      10,3667  30200 0    V97N00   VN     09700        PASTE FOR V97 OR V99
12761                     10,3670  20100 1    OCT20100 OCT    20100
```

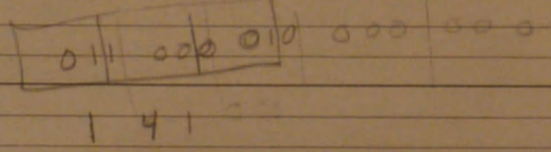

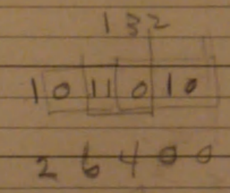

L SERVICE ROLTINES USER'S PAGE NO. 1 EO S4

```
0037                          7717                    BLOCK  3
0038  REF    1                6000                    SETLOC FFTAG6
0039                          7717                    BANK
0040  REF    1                                        COUNT  03/FLAG

0043  REF 231  LAST 1442      7717  54 001 1  UPENT2  TS     L        WHICH FLAGWORD IS IT
0044  REF   4  LAST 1378      7720  7 4716 1          MASK   OCT7
0045  REF 232  LAST 1449      7721  56 001 C          XCH    L        SAVE IN L FOR INDEXING

0046  REF   3  LAST 1360      7722  7 5630 C          MASK   OCT77770  OBTAIN THE BIT INFORMATION
0047                          7723  0 0004 C          INHINT          PREVENT INTERUPTS
0048  REF  30  LAST 1400      7724  54 061 1          TS     ITEMP1   STORE THE BIT INFORMATION TEMPORARIALY

0049  REF 233  LAST 1449      7725  50 001 C          NDX    L
0050  REF  12  LAST  990      7726  4 0074 C          CS     FLAGWRD0
0051  REF  31  LAST 1449      7727  7 0061 1          MASK   ITEMP1
0052  REF 234  LAST 1449      7730  50 001 C          NDX    L
0053  REF  13  LAST 1449      7731  26 074 C          ADS    FLAGWRD0
0054                          7732  0 0003 1          RELINT          RELEASE INTERUPT INHIBIT

0055  REF 339  LAST 1449      7733  24 002 C          INCR   Q        OBTAIN THE CORRECT RETURN ADDRESS
0056  REF 340  LAST 1449      7734  0 0002 C          TC     Q        RETURN

0059  REF 235  LAST 1449      7735  54 001 1  COWENT2 TS     L        WHICH FLAGWORD IS IT
0060  REF   5  LAST 1449      7736  7 4716 1          MASK   OCT7
0061  REF 236  LAST 1449      7737  56 001 C          XCH    L        SAVE IN L FOR INDEXING

0062  REF   4  LAST 1449      7740  7 5630 C          MASK   OCT77770  OBTAIN THE BIT INFORMATION
0063                          7741  4 0000 C          COM             START TO PROCESS THE INFORMATION

0064                          7742  0 0004 C          INHINT          PREVENT INTERUPTS
0065  REF 237  LAST 1449      7743  50 001 C          NDX    L
0066  REF  14  LAST 1449      7744  7 0074 C          MASK   FLAGWRD0
0067  REF 238  LAST 1449      7745  50 001 C          NDX    L
0068  REF  15  LAST 1449      7746  54 074 C          TS     FLAGWRD0
0069                          7747  0 0003 1          RELINT          RELEASE INTERUPT INHIBIT

0070  REF 341  LAST 1449      7750  24 002 C          INCR   Q        OBTAIN THE CORRECT RETURN ADDRESS
0071  REF 342  LAST 1449      7751  0 0002 C          TC     Q        RETURN

0072  REF  24  LAST 1440       4716                OCT7    EQUALS SEVEN
0073                        10,3671                       BANK   10
```

```
P0074
R0075       UPFLAG AND DOWNFLAG ARE ENTIRELY GENERAL FLAG SETTING AND CLEARING SUBROUTINES.  USING THEM, WHETHER OR
R0077  NOT IN INTERRUPT, ONE MAY SET OR CLEAR ANY SINGLE, NAMED BIT IN ANY ERASABLE REGISTER, SUBJECT OF COURSE TO
R0079  EBANK SETTING.  A "NAMED" BIT, AS THE WORD IS USED HERE, IS ANY BIT WITH A NAME FORMALLY ASSIGNED BY THE YUL
R0081  ASSEMBLER.

R0082       AT PRESENT THE ONLY NAMED BITS ARE THOSE IN THE FLAGWORDS.  ASSEMBLER CHANGES WILL MAKE IT POSSIBLE TO
R0084  NAME ANY BIT IN ERASABLE MEMORY.

R0085       CALLING SEQUENCES ARE AS FOLLOWS:-

R0086                          TC     UPFLAG                    TC     DOWNFLAG
R0087                          ADRES  NAME OF FLAG              ADRES  NAME OF FLAG

R0088       RETURN IS TO THE LOCATION FOLLOWING THE "ADRES" ABOUT .58 MS AFTER THE "TC".

R0090       UPON RETURN A CONTAINS THE CURRENT FLAGWRD SETTING.

 0091                                5435                      BLOCK  02
 0092  REF   5  LAST 1377           4000                      SETLOC FFTAG1
 0093                                5435                      BANK
 0094  REF   1                                                 COUNT* $$/FLAG

 0095  REF 343  LAST 1449           5435  3 0002 C  UPFLAG    CA     Q
 0096  REF   1                      5436  0 5453 C            TC     DEBIT
 0097                                5437  4 0000 C            COM                      +(15 - BIT)
 0098                                5440  0 0006 1            EXTEND
 0099  REF  16  LAST 1098           5441  04 001 1            ROR    LCHAN             SET BIT
 0100  REF  32  LAST 1449           5442  50 061 C  COMFLAG   INDEX  ITEMP1
 0101  REF  16  LAST 1449           5443  54 074 C            TS     FLAGWRD0
 0102  REF   5  LAST 1375           5444  22 063 1            LXCH   ITEMP3
 0103                                5445  0 0003 1            RELINT
 0104  REF 239  LAST 1449           5446  0 0001 C            TC     L

 0105  REF 344  LAST 145C           5447  3 0002 C  DOWNFLAG  CA     Q
 0106  REF   2  LAST 145C           5450  0 5453 C            TC     DEBIT
 0107  REF 240  LAST 145C           5451  7 0001 1            MASK   L                 RESET BIT
 0108  REF   1                      5452  1 5442 1            TCF    COMFLAG

 0109  REF 174  LAST 1445           5453  6 4712 1  DEBIT     AD     ONE               GET DE BITS
 0110                                5454  0 0004 0            INHINT
 0111  REF   6  LAST 145C           5455  54 063 C            TS     ITEMP3
 0112  REF   4  LAST 1164           5456  3 4721 1            CA     LOW4              DEC15
 0113  REF  33  LAST 145C           5457  54 061 1            TS     ITEMP1
 0114  REF   7  LAST 145C           5460  50 063 1            INDEX  ITEMP3
 0115                                5461  2*7777 C            CA     0 -1              ADRES
 0116  REF 241  LAST 145C           5462  54 0C1 1            TS     L
 0117  REF 279  LAST 1445           5463  3 4714 1            CA     ZERO
```

```
0118                                5464  0 0006 1        EXTEND
0119   REF  34  LAST 145C          5465  1C 061 1        DV      ITEMP1      A = FLAGWRD, L = (15 - BIT)
0120   REF  35  LAST 1451          5466  52 062 1        DXCH    ITEMP1
0121   REF  36  LAST 1451          5467  50 061 C        INDEX   ITEMP1
0122   REF  17  LAST 145C          5470  3 0074 1        CA      FLAGWRD0
0123   REF 242  LAST 145C          5471  54 0C1 1        TS      L           CURRENT STATE
0124   REF  22  LAST 1399          5472  5C 062 C        INDEX   ITEMP2
0125   REF  56  LAST 143C          5473  4 4674 1        CS      BIT15       -(15 - BIT)
0126   REF 345  LAST 145C          5474  0 0002 0        TC      Q
```

```
P0127   DELAYJOB- A GENERAL ROUTINE TO DELAY A JOB A SPECIFIC AMOUNT OF TIME BEFORE PICKING UP AGAIN.

R0129   ENTRANCE REQUIREMENTS...
A0130                                                   CAF     DT              DELAY JOB FOR DT CENTISECS
A0131                                                   TC      BANKCALL
A0132                                                   CADR    DELAYJOB

 0133                           06,3651                 BANK    06
 0134   REF   1                 00,2000                 SETLOC  DLAYJOB
 0135                           00,3730                 BANK

R0136   THIS MUST REMAIN IN BANK 0 ****************************************
 0137   REF   1                                         COUNT   00/DELAY

 0138                           00,3730  0 0004 0  DELAYJOB INHINT
 0139   REF 346  LAST 1451      00,3731  54 002 1         TS      Q               STORE DELAY DT IN Q FOR DLY -1 IN

 0140   REF   1                 00,3732  3 6214 0         CAF     DELAYNUM        WAITLIST
 0141   REF  37  LAST 1401      00,3733  54 070 1  DELLOOP TS     RUPTREG1
 0142   REF 414  LAST 1446      00,3734  50 000 1         INDEX   A
 0143   REF   5  LAST  186      00,3735  3 1141 1         CA      DELAYLOC        IS THIS DELAYLOC AVAILABLE
 0144                           00,3736  0 0006 1         EXTEND
 0145   REF   1                 00,3737  1 3744 1         BZF     OK2DELAY        YES

 0146   REF  38  LAST 1452      00,3740  10 070 1         CCS     RUPTREG1        NO, TRY NEXT DELAYLOC
 0147   REF   1                 00,3741  1 3733 1         TCF     DELLOOP

 0148   REF   7  LAST 1196      00,3742  0 5604 0         TC      BAILOUT         NO AVAILABLE LOCS AVAILABLE.
 0149                           00,3743   01104 0         OCT     1104

 0150   REF   1                 00,3744  3 3764 1  OK2DELAY CA     TCSLEEP         SET WAITLIST IMMEDIATE RETURN
 0151   REF   5  LAST 119C      00,3745  54 061 1         TS      WAITEXIT

 0152   REF  30  LAST 1177      00,3746  3 0004 0         CA      FBANK
 0153   REF  39  LAST 1452      00,3747  6 0070 0         AD      RUPTREG1        STORE BBANK FOR TASK CALL
 0154   REF 243  LAST 1451      00,3750  54 001 1         TS      L

 0155   REF   1                 00,3751  3 3765 0         CAF     WAKECAD         STORE CADR FOR TASK CALL
 0156   REF   2  LAST 119C      00,3752  1 5146 0         TCF     DLY2 -1         DLY IS IN WAITLIST ROUTINE

 0157   REF   7  LAST 1437      00,3753  0 4604 1  TCGETCAD TC     MAKECADR        GET CALLERS FCADR

 0158   REF  40  LAST 1452      00,3754  50 070 0         INDEX   RUPTREG1
 0159   REF   6  LAST 1452      00,3755  55'141 0         TS      DELAYLOC        SAVE DELAY CADRS

 0160   REF   8  LAST 1438      00,3756  0 5070 0         TC      JOBSLEEP

 0161   REF 280  LAST 1450      00,3757  3 4714 1  WAKER   CAF     ZERO
 0162   REF  36  LAST 1436      00,3760  50 006 1         INDEX   BBANK
 0163   REF   7  LAST 1452      00,3761  57'141 1         XCH     DELAYLOC        MAKE DELAYLOC AVAILABLE
```

```
0164   REF  13  LAST 1439   00,3762  0 5074 1            TC      JOBWAKE

0165   REF  73  LAST 1403   00,3763  0 5213 1            TC      TASKOVER

0166   REF   1              00,3764   03751 1 TCSLEEP   GENADR TCGETCAD -2
0167   REF   1              00,3765   03757 1 WAKECAD   GENADR WAKER
```

```
P0169   GENTRAN, A BLOCK TRANSFER ROUTINE.

R0170   WRITTEN BY D. EYLES
R0171   MOD 1 BY KERNAN                                        UTILITYM REV 17 11/18/67

R01722  MOD 2 BY SCHULENBERG  (REMOVE RELINT)   SKIPPER REV 4 2/28/68

R0173           THIS ROUTINE IS USEFULL FOR TRANSFERING N CONSECUTIVE ERASABLE OR FIXED QUANTITIES TO SOME OTHER N
R0175   CONSECUTIVE ERASABLE LOCATIONS.  IF BOTH BLOCKS OF DATA ARE IN SWITCHABLE EBANKS, THEY MUST BE IN THE SAME ONE.

R0177           GENTRAN IS CALLABLE IN A JOB AS WELL AS A RUPT.  THE CALLING SEQUENCE IS:

A0179                                   I       CA      N-1             # OF QUANTITIES MINUS ONE.
A0180                                   I +1    TC      GENTRAN         IN FIXED-FIXED.
A0181                                   I +2    ADRES   L               STARTING ADRES OF DATA TO BE MOVED.
A0182                                   I +3    ADRES   M               STARTING ADRES OF DUPLICATION BLOCK.
A0183                                   I +4                            RETURNS HERE.

R0184           GENTRAN TAKES 25 MCT'S (300 MICROSECONDS) PER ITEM + 5 MCT'S (60 MICS) FOR ENTERING AND EXITING.

R0186           A, L AND ITEMP1 ARE NOT PRESERVED.

 0187                           5475                    BLOCK   02
 0188   REF   2  LAST 1429     4000                    SETLOC  FFTAG4
 0189                           5475                    BANK

 0190   REF  37  LAST 1451     0061                    EBANK=  ITEMP1

 0191   REF   1                                        COUNT*  $$/TRAN

 0192                           5475  0 0004 C  GENTRAN INHINT
 0193   REF  38  LAST 1454     5476  54 061 1          TS      ITEMP1          SAVE N-1.
 0194   REF 347  LAST 1452     5477  50 002 C          INDEX   Q               C(Q) = ADRES L.
 0195                          5500  6 0000 1          AD      0               ADRES (L + N - 1).
 0196   REF 415  LAST 1452     5501  50 000 1          INDEX   A
 0197                          5502  3 0000 1          CA      0               C(ABOVE).
 0198   REF 244  LAST 1452     5503  54 001 1          TS      L               SAVE DATA.
 0199   REF  39  LAST 1454     5504  3 0061 C          CA      ITEMP1
 0200   REF 348  LAST 1454     5505  50 002 C          INDEX   Q
 0201                          5506  6 0001 C          AD      1               ADRES (M + N - 1).
 0202   REF 416  LAST 1454     5507  50 000 1          INDEX   A
 0203                          5510  22 000 1          LXCH    0               STUFF IT.
 0204   REF  40  LAST 1454     5511  10 061 1          CCS     ITEMP1          LOOP UNTIL N-1 = 0.
 0205   REF  13  LAST  782     5512  1 5476 C          TCF     GENTRAN +1
 0207   REF   4  LAST 1368     5513  1 6710 C          TCF     Q+2             RETURN TO CALLER.
```

P0208 B5CFF ZERO BIT 5 OF EXTVBACT, WHICH IS SET BY TESTXACT.

R0209 MAY BE USED AS NEEDED BY ANY EXTENDED VERB WHICH HAS DONE TESTXACT

0211 REF 1 COUNT* $$/EXTVB

0212 REF 49 LAST 1442 5514 4 4706 C B5OFF CS BIT5
0213 REF 21 LAST 1429 5515 7 1044 1 MASK EXTVBACT
0214 REF 22 LAST 1455 5516 55'044 1 TS EXTVBACT
0215 REF 119 LAST 1447 5517 0 5112 C TC ENDOFJOB

P0216 SUBROUTINES TO TURN OFF AND TURN ON TRACKER FAIL LIGHT.

```
0217                                5520  0 0004 0  TRFAILOF INHINT
0218  REF   1                      5521  4 7704 1           CS      OCT40200        TURN OFF TRACKER LIGHT
0219  REF  44  LAST 1392           5522  7 1036 1           MASK    DSPTAB +11D
0220  REF  57  LAST 1451           5523  6 4674 0           AD      BIT15
0221  REF  45  LAST 1456           5524  55'036 1           TS      DSPTAB +11D
02215 REF  33  LAST  217          5525  4 1331 0           CS      OPTMODES        TO INSURE THAT OCDU FAIL WILL GO ON
02216 REF  53  LAST 1374          5526  7 4704 1           MASK    BIT7            AGAIN IF IT WAS ON IN ADDITION TO
02217 REF  34  LAST 1456          5527  27'331 0           ADS     OPTMODES        TRACKER FAIL.

0222                                5530  0 0003 1  REQ     RELINT
0223  REF 349  LAST 1454           5531  0 0002 0           TC      Q

0224                                5532  0 0004 0  TRFAILON INHINT
0225  REF  46  LAST 1456           5533  4 1036 1           CS      DSPTAB +11D     TURN ON
0226  REF   2  LAST 1456           5534  7 7704 1           MASK    OCT40200
0227  REF  47  LAST 1456           5535  27'036 1           ADS     DSPTAB +11D
0228  REF   1                      5536  1 5530 0           TCF     REQ
```

L ALARM AND ABORT USER'S PAGE NO. 1 EQ S4

```
R0001           THE FOLLOWING SUBROUTINE MAY BE CALLED TO DISPLAY A NON-ABORTIVE ALARM CONDITION. IT MAY BE CALLED
R0003   EITHER IN INTERRUPT OR UNDER EXECUTIVE CONTROL.

R0004           CALLING SEQUENCE IS AS FOLLOWS:

R0005           TC      ALARM
R0006           OCT     AAANN           ALARM NO. NN IN GENERAL AREA AAA.
R0007                                   (RETURNS HERE)

 0008                           5537                    BLOCK   02
 0009   REF   1                4000                    SETLOC  FFTAG7
 0010                           5537                    BANK

 0011   REF   8 LAST  38C       0375                    EBANK=  FAILREG

 0012   REF   1                                        COUNT   02/ALARM

R0013   ALARM TURNS ON THE PROGRAM ALARM LIGHT, BUT DOES NOT DISPLAY.

 0014                           5537  0 0004 C  ALARM    INHINT

 0015   REF 35C  LAST 145E      5540  3 0002 C          CA      Q
 0016   REF   4  LAST 136C      5541  55'363 1  ALARM2  TS      ALMCADR
 0017   REF 351  LAST 1457      5542  5C 002 C          INDEX   Q
 0018                           5543  3 0000 1          CA      0
 0019   REF 245  LAST 1454      5544  54 0C1 1  BORTENT  TS      L

 0020   REF  37  LAST 1452      5545  3 0006 1  PRIOENT  CA      BBANK
 00202                          5546  0 0006 1   +1      EXTEND
 00204  REF  26  LAST 1436      5547  04 007 1          ROR     SUPERBNK        ADD SUPER BITS.
 0021   REF   5  LAST 1457      5550  55'364 C          TS      ALMCADR +1

 0022   REF 352  LAST 1457      5551  3 0002 C  LARMENT  CA      Q               STORE RETURN FOR ALARM
 0023   REF  41  LAST 1454      5552  54 061 1          TS      ITEMP1

 0024   REF   9  LAST 1457      5553  10 375 1  CHKFAIL1 CCS     FAILREG         IS ANYTHING IN FAILREG
 0025   REF   1                 5554  1 5557 1          TCF     CHKFAIL2        YES TRY NEXT REG
 0026   REF  10  LAST 1457      5555  22 375 C          LXCH    FAILREG
 0027   REF   1                 5556  1 5571 C          TCF     PROGLARM        TURN ALARM LIGHT ON FOR FIRST ALARM

 0028   REF  11  LAST 1457      5557  10 376 1  CHKFAIL2 CCS     FAILREG +1
 0029   REF   1                 5560  1 5563 C          TCF     FAIL3
 0030   REF  12  LAST 1457      5561  22 376 C          LXCH    FAILREG +1
 0031   REF   1                 5562  1 5574 C          TCF     MULTEXIT

 0032   REF  13  LAST 1457      5563  3 0377 1  FAIL3    CA      FAILREG +2
 0033   REF  37  LAST 1198      5564  7 4672 1          MASK    POSMAX
 0034   REF 417  LAST 1454      5565  1C 000 C          CCS     A
 0035   REF   1                 5566  1 5600 C          TCF     MULTFAIL
 0036   REF  14  LAST 1457      5567  22 377 1          LXCH    FAILREG +2
```

```
0037  REF   2  LAST 1457      5570  1 5574 C            TCF     MULTEXIT

0038  REF  48  LAST 1456      5571  4 1036 1  PROGLARM  CS      DSPTAB +11D
0039  REF   2  LAST 1433      5572  7 5612 C            MASK    OCT40400
0040  REF  49  LAST 1458      5573  27'036 1            ADS     DSPTAB +11D

0041  REF  42  LAST 1457      5574  56 061 C  MULTEXIT  XCH     ITEMP1          OBTAIN RETURN ADDRESS IN A
0042                           5575  0 0003 1            RELINT
0043  REF 418  LAST 1457      5576  50 000 1            INDEX   A
0044                           5577  0 0001 C            TC      1

0045  REF 246  LAST 1457      5600  3 0001 C  MULTFAIL  CA      L
0046  REF  58  LAST 1456      5601  6 4674 C            AD      BIT15
0047  REF  15  LAST 1457      5602  54 377 C            TS      FAILREG +2

0048  REF   3  LAST 1458      5603  1 5574 C            TCF     MULTEXIT

R0049 PRIOLARM DISPLAYS V05N09 VIA PRIOSPR WITH 3 RETURNS TO THE USER FROM THE ASTRONAUT AT CALL LOC +1,+2,+3 AND
R0051 AN IMMEDIATE RETURN TO THE USER AT CALL LOC +4. EXAMPLE FOLLOWS,
A0052                                               CAF     OCTXX           ALARM CODE
A0053                                               TC      BANKCALL
A0054                                               CADR    PRIOLARM

A0055                                               ...     ...
A0056                                               ...     ...
A0057                                               ...     ...             ASTRONAUT RETURN
A0058                                               TC      PHASCHNG        IMMEDIATE RETURN TO USER. RESTART
A0059                                               OCT     X.1             PHASE CHANGE FOR PRIO DISPLAY

0060                           10,3671                      BANK    10
0061  REF   2  LAST 1429      10,2000                      SETLOC  DISPLAYS
0062                           10,3671                      BANK

0063  REF   2 LAST 1429 TO 1449:   650   65C*               COUNT   10/DSPLA

0064                           10,3671  0 0004 C  PRIOLARM  INHINT          * * * KEEP IN DISPLAY ROUTINES BANK
0065  REF 247  LAST 1458       10,3672  54 001 1            TS      L       SAVE ALARM CODE

0066  REF  24  LAST 1406       10,3673  3 0133 C            CA      BUF2    2 CADR OF PRIOLARM USER
0067  REF   6  LAST 1457       10,3674  55'363 1            TS      ALMCADR
0068  REF  25  LAST 1458       10,3675  3 0134 1            CA      BUF2 +1
0069  REF   1                  10,3676  0 5546 C            TC      PRIDSPT +1      * LEAVE L ALONE
0071                           10,3677   77467 1  -2SEC     DEC     -200            *** DONT MOVE
0072  REF   5  LAST  756       10,3700  3 4743 C            CAF     V05N09
0073  REF   1                  10,3701  1 2632 C            TCF     PRIODSPR

0074                              5604                      BLOCK   02
0075  REF   2  LAST 1457          4000                      SETLOC  FFTAG7
0076                              5604                      BANK
```

```
0077   REF   2 LAST 1457 TC 1458:    37    37*          COUNT  02/ALARM

0078                               5604  0 0004 C  BAILOUT  INHINT
0079   REF 353  LAST 1457          5605  3 0002 C           CA     Q
0080   REF   7  LAST 1458          5606  55'363 1           TS     ALMCADR

0081   REF 354  LAST 1459          5607  50 002 C           INDEX  Q
0082                               5610  3 0000 1           CAF    0
0083   REF   1                     5611  0 5544 1           TC     BORTENT
0084                               5612   40400 1  OCT40400 OCT    40400

00845                              5613  0 0004 C           INHINT
0085   REF  78  LAST 1443          5614  3 4711 1  WHIMPER  CA     TWO
00851  REF  17  LAST 1368          5615  6 0005 1           AD     Z
00852  REF   1                     5616  54 017 C           TS     BRUPT
00853                              5617  5 0017 1           RESUME
00854  REF  64  LAST 1429          5620  0 4574 0           TC     POSTJUMP      RESUME SENDS CONTROL HERE
00855  REF   3  LAST  253          5621   12632 C           CADR   ENEMA
008552                             5622  0 0004 0  POODOO   INHINT
008553 REF 355  LAST 1459          5623  3 0002 C           CA     Q
008554 REF   8  LAST 1459          5624  55'363 1  ABORT2   TS     ALMCADR
008555 REF 356  LAST 1459          5625  50 002 C           INDEX  Q
008556                             5626  3 0000 1           CAF    0
008557 REF   2  LAST 1459          5627  0 5544 1           TC     BORTENT
008558                             5630   77770 1  OCT77770 OCT    77770         DONT MOVE
00856  REF  82  LAST 1429          5631  4 4712 C           CS     BIT1
008561 REF  26  LAST 1390          5632  7 0075 1           MASK   FLAGWRD1
008562 REF  27  LAST 1459          5633  54 075 1           TS     FLAGWRD1      RESET AVEGFLAG
008563 REF  58  LAST 1441          5634  4 4705 C           CS     BIT6
008564 REF  24  LAST 1414          5635  7 0103 1           MASK   FLAGWRD7
008565 REF  25  LAST 1459          5636  54 103 1           TS     FLAGWRD7      RESET V37FLAG

00857  REF 248  LAST 1410          5637  0 4555 C           TC     BANKCALL
00858  REF   2  LAST  179          5640   12465 C           CADR   MR.KLEAN
00859  REF   1                     5641  0 5614 1           TC     WHIMPER

0086                               5642  0 0004 C  CCSHOLE  INHINT
0087   REF 357  LAST 1459          5643  3 0002 C           CA     Q
0089   REF   1                     5644  0 5624 1           TC     ABORT2
0090                               5645   01103 1  OCT1103  OCT    1103
0091                               5646  0 0004 C  CURTAINS INHINT
0092   REF 358  LAST 1459          5647  3 0002 C           CA     Q
0094   REF   2  LAST 1360          5650  0 5541 1           TC     ALARM2
0095                               5651   00217 0  OCT217   OCT    00217
0096   REF   9  LAST 1459          5652  0 1363 C           TC     ALMCADR       RETURN TO USER

0099   REF 120  LAST 1455          5112                DOALARM  EQUALS ENDOFJOB
R0100  CALLING SEQUENCE FOR VARALARM

A0101                                                  CAF    (ALARM)
```

```
A0102                                                   TC      VARALARM

R0103   VARALARM TURNS ON PROGRAM ALARM LIGHT BUT DOES NOT DISPLAY
 0104                           5653  0 0004 0  VARALARM INHINT

 0105   REF 248  LAST 1458      5654  54 001 1            TS      L               SAVE USERS ALARM CODE

 0106   REF 359  LAST 1459      5655  3 0002 0            CA      Q               SAVE USERS Q
 0107   REF  10  LAST 1459      5656  55'363 1            TS      ALMCADR

 0108   REF   2  LAST 1458      5657  0 5545 0            TC      PRIDENT
 0109                           5660   00014 1  OCT14     OCT     14              DONT MOVE

 0110   REF  11  LAST 146C      5661  0 1363 0            TC      ALMCADR         RETURN TO USER

 0111   REF   8  LAST 1452      5604                ABORT   EQUALS BAILOUT        *** TEMPORARY UNTIL ABORT CALLS OUT
```

L UPDATE PROGRAM USER'S PAGE NO. 1 EO S4

R0001 PROGRAM NAME: P27
R0002 WRITTEN BY: KILROY/ DE WOLF

R0003 MCD NO: 6
R0004 MCC BY: KILROY
R0005 DATE: 01DEC67

R0006 LOG SECTION: UPDATE PROGRAM.

R0007 FUNCT. DESCR: P27 (THE UPDATE PROGRAM) PROCESSES COMMANDS AND DATA
R0008 INSERTIONS REQUESTED BY THE GROUND VIA UPLINK.
R0009 THE P27 PROGRAM WILL ACCEPT UPDATES
R0010 ONLY DURING P00 FOR THE LM, AND ONLY DURING P00,
R0011 P02, AND FRESH START FOR THE CSM

R0012 CALLING SEQ: PROGRAM IS INITIATED BY UPLINK ENTRY OF VERBS 70, 71, 72 AND 73.

R0014 SUBROUTINES: TESTXACT, NEWMODEX, NEWMODEX +3, GOXDSPF, BANKCALL, FINDVAC, INTPRET, INTSTALL, TPAGREE,
R0016 INTWAKEU, ENDEXT, POSTJUMP, FALTON, NEWPHASE, PHASCHNG

R0017 NORMAL EXIT: TC ENDEXT

R0018 ALARM/ABORT: TC FALTON FOLLOWED BY TC ENDEXT

R0019 RESTARTS: P27 IS RESTART PROTECTED IN TWO WAYS...
R0020 1. PRIOR TO VERIFLAG INVERSION(WHICH IS CAUSED BY THE GROUND/ASTRONAUT'S VERIFICATION OF UPDATE
R0022 DATA BY SENDING A V33E WHEN V21N02 IS FLASHING)---
R0023 NO PROTECTION EXCEPT PRE-P27 MODE IS RESTORED, COAST + ALIGN DOWNLIST IS SELECTED AND UPLINK
R0025 ACTIVITY LIGHT IS TURNED OFF.(JUST AS IF A V34E WAS SENT DURING P27 DATA LOADS).
R0027 V70,V71,V72 OR V73 WILL HAVE TO BE COMPLETELY RESENT BY USER.
R0029 2. AFTER VERIFLAG INVERSION(WHEN UPDATE OF THE SPECIFIED ERASABLES IS BEING PERFORMED)---
R0031 PROTECTED AGAINST RESTARTS.

R0032 DEBRIS: UPBUFF (20D) TEMP STORAGE FOR ADDRESSES AND CONTENTS.
R0033 UPVERB (1) VERB NUMBER MINUS 70D (E.G. FOR V72, UPVERB = 72D - 70D = 2)
R0035 UPOLDMOD (1) FOR MAJOR MODE INTERRUPTED BY P27.
R0036 COMPNUMB (1) TOTAL NUMBER OF COMPONENTS TO BE TRANSMITTED.
R0038 UPCOUNT (1) ACTUAL NUMBER OF COMPONENTS RECEIVED.
R0039 UPTEMP (1) SCRATCH, BUT USUALLY CONTAINS COMPONENT NUMBER TO BE CHANGED DURING VERIFY CYCLE

R0041 INPUT:

R0042 ENTRY: DESCRIPTION

R0043 V70E+XXXXXEXXXXXE (LIFTOFF TIME INCREMENT) DOUBLE PRECISION OCTAL TIME INCREMENT, XXXXX XXXXX,
R0045 IS ADDED TO TEPHEM, SUBTRACTED FROM AGC CLOCK(TIME2,TIME1), SUBTRACTED FROM CSM STATE
R0047 VECTOR TIME(TETCSM) AND SUBTRACTED FROM LEM STATE VECTOR TIME(TETLEM).
R0049 THE DP OCTAL TIME INCREMENT IS SCALED AT 2(28).

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R0050   V71E11EAAAAE    (CONTIGUOUS BLOCK UPDATE) II-2 OCTAL COMPONENTS,XXXXX,
R0051   XXXXXE          ARE LOADED INTO ERASABLE STARTING AT ECADR, AAAA.
R0052   XXXXXE          II IS .GE. 3 .AND. .LE. 200.,
R0053                   AND (AAAA + II - 3) DOES NOT PRODUCE AN ADDRESS IN THE
R0054   9 NEXT BANK
R0055     .             SCALING IS SAME AS INTERNAL REGISTERS.

R0056   V72E11E         (SCATTER UPDATE) (II-1)/2 OCTAL COMPONENTS,XXXXX, ARE
R0057   AAAAEXXXXXE     LOADED INTO ERASABLE LOCATIONS, AAAA.
R0058   AAAAEXXXXXE     II IS .GE. 3 .AND. .LE. 190, AND MUST BE ODD.
R0060     .             SCALING IS SAME AS INTERNAL REGISTERS.

R0061   V73EXXXXXEXXXXXE (OCTAL CLOCK INCREMENT) DOUBLE PRECISION OCTAL TIME
R0062                   INCREMENT XXXXX XXXXX, IS ADDED TO THE AGC CLOCK, IN
R0063                   CENTISECONDS SCALED AT (2)28.
R0064                   THIS LOAD IS THE OCTAL EQUIVALENT OF V55.


R0065   OUTPUT:         IN ADDITION TO THE ABOVE REGISTER LOADS, ALL UPDATES
R0066                   COMPLEMENT BITS OF FLAGWORD7.


R0067   ADDITIONAL NOTES: VERB 71, JUST DEFINED ABOVE WILL BE USED TO PERFORM BUT NOT LIMITED TO THE FOLLOWING UPDATES--
R0069                   1. CSM/LM STATE VECTOR UPDATE
R0072                   2. REFSMMAT UPDATE


R0073           THE FOLLOWING COMMENTS DELINEATE EACH SPECIAL UPDATE----

R0074   1. CSM/LM STATE VECTOR UPDATE(ALL DATA ENTRIES IN OCTAL)

R0075   ENTRIES:       DATA DEFINITION:                                    SCALE FACTORS:
R0077   V71E            CONTIGUOUS BLOCK UPDATE VERB
R0078      21E          NUMBER OF COMPONENTS FOR STATE VECTOR UPDATE
R0080    AAAAE          ECADR OF 'UPSVFLAG'
R0082   XXXXXE          STATE VECTOR IDENTIFIER: 00001 FOR CSM, 77776 FOR LEM - EARTH SPHERE OF INFLUENCE SCALING
R0083                                            00002 FOR CSM, 77775 FOR LEM - LUNAR SPHERE OF INFLUENCE SCALING
R0084   XXXXXEXXXXXE   X POSITION
R0086   XXXXXEXXXXXE   Y POSITION
R0088   XXXXXEXXXXXE   Z POSITION
R0090   XXXXXEXXXXXE   X VELOCITY
R0092   XXXXXEXXXXXE   Y VELOCITY
R0094   XXXXXEXXXXXE   Z VELOCITY
R0096   XXXXXEXXXXXE   TIME FROM AGC CLOCK ZERO
R0098   V33E            VERB 33 TO SIGNAL THAT THE STATE VECTOR IS READY TO BE STORED.


R0144   2. REFSMMAT(ALL DATA ENTRIES IN OCTAL)
R0145   ENTRIES:       DATA DEFINITIONS:                                   SCALE FACTORS:
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R0147   V71E            CONTIGUOUS BLOCK UPDATE VERB
R0148     24E           NUMBER OF COMPONENTS FOR REFSMMAT UPDATE
R0150    AAAAE          ECADR OF 'REFSMMAT'
R0152   XXXXXEXXXXXE    ROW 1 COLUMN 1                                  2(-1)
R0154   XXXXXEXXXXXE    ROW 1 COLUMN 2                                  2(-1)
R0156   XXXXXEXXXXXE    ROW 1 COLUMN 3                                  2(-1)
R0158   XXXXXEXXXXXE    ROW 2 COLUMN 1                                  2(-1)
R0160   XXXXXEXXXXXE    ROW 2 COLUMN 2                                  2(-1)
R0162   XXXXXEXXXXXE    ROW 2 COLUMN 3                                  2(-1)
R0164   XXXXXEXXXXXE    ROW 3 COLUMN 1                                  2(-1)
R0166   XXXXXEXXXXXE    ROW 3 COLUMN 2                                  2(-1)
R0168   XXXXXEXXXXXE    ROW 3 COLUMN 3                                  2(-1)
R0170   V33E            VERB 33 TO SIGNAL THAT REFSMMAT IS READY TO BE STORED.


 0171                           07,3717                  BANK   07
 0172   REF   4 LAST  536      43,2000                  SETLOC EXTVERBS
 0173                           43,3721                  BANK

 0174   REF  13 LAST  738      E3,1706                  EBANK= TEPHEM

 0175   REF   1                                         COUNT* $$/P27
 0176   REF   1                43,3721  3 4714 1 V70UPDAT CAF    UP70          COMES HERE ON V70E
 0177   REF   2 LAST  229      43,3722  1 3730 1         TCF    V73UPDAT +1


 0178   REF   1                43,3723  3 4712 1 V71UPDAT CAF    UP71          COMES HERE ON V71E
 0179   REF   3 LAST 1463      43,3724  1 3730 1         TCF    V73UPDAT +1


 0180   REF   1                43,3725  3 4711 1 V72UPDAT CAF    UP72          COMES HERE ON V72E
 0181   REF   4 LAST 1463      43,3726  1 3730 1         TCF    V73UPDAT +1


 0182   REF   1                43,3727  3 6214 0 V73UPDAT CAF    UP73          COMES HERE ON V73E

 0183   REF   1                43,3730  54 331 1  +1     TS     UPVERBSV      SAVE UPVERB UNTIL IT'S OK TO ENTER P27

 0184   REF  18 LAST  260      43,3731  0 2076 1         TC     TESTXACT      GRAB DISPLAY IF AVAILABLE, OTHERWISE
A0185                                                                        TURN*OPERATOR ERROR* ON AND TERMINATEJOB

 0186   REF  18 LAST 1368      43,3732  3 1011 0         CA     MODREG        CHECK IF UPDATE ALLOWED
 0187                          43,3733  0 0006 1         EXTEND               FIRST CHECK FOR MODREG = +0, -0
 0188                          43,3734  1 3736 1         BZF    +2            (+0 = P00, -0 = FRESH START)
 0189   REF   1                43,3735  0 3746 1         TC     CKMDMORE      NOW CHECK FOR PROGRAM WHICH CAN BE
A0190                                                                        INTERRUPTED BY P27.

 0191   REF  19 LAST 1463      43,3736  31'011 0         CAE    MODREG        UPDATE ALLOWED.
 0192   REF   2 LAST   69      43,3737  54 301 1         TS     UPOLDMOD      SAVE CURRENT MAJOR MODE
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0193   REF   2  LAST 1463   43,3740   30 331 C          CAE    UPVERESV        SET UPVERB TO INDICATE TO P27
0194   REF   2  LAST   69   43,3741   54 302 1          TS     UPVERB          WHICH EXTENDED VERB CALLED IT.

0195   REF 175  LAST 1450   43,3742    3 4712 1         CAF    ONE
0196   REF   2  LAST   69   43,3743   54 303 C          TS     UPCOUNT         INITIALIZE UPCOUNT TO 1

0197   REF  65  LAST 1459   43,3744    0 4574 C         TC     POSTJUMP        LEAVE EXTENDED VERB BANK AND
0198   REF   1              43,3745     57335 C         CADR   UPPART2         GO TO UPDATE PROGRAM(P27) BANK.


0199   REF  16  LAST 1413   43,3746    4 0101 C  CKMCMORE CS     FLAGWRD5
0200   REF  33  LAST 144C   43,3747    7 4703 C          MASK   BIT8            CHECK IF COMPUTER IS LGC
0201   REF 419  LAST 145E   43,3750   10 000 C           CCS    A              IS COMPUTER LGC OR AGC
0202   REF   1              43,3751    1 3757 C  UPERLEM  TCF    UPERROR        ERROR- IT'S THE LEM + MODE IS NOT P00.
0203   REF  79  LAST 1455   43,3752    4 4711 C          CS     TWO
0204   REF  20  LAST 1463   43,3753    7 1011 1          MASK   MODREG
0205   REF 420  LAST 1464   43,3754   10 000 C           CCS    A
0206   REF   2  LAST 1464   43,3755    1 3757 C  UPERCMC  TCF    UPERROR        ERROR- IT'S THE CMC AND MODE IS NOT
A0207                                                                          P00 OR P02.
0208   REF 360  LAST 146C   43,3756    0 0002 C          TC     Q              ALLOW UPDATE TO PROCEED

0209   REF  66  LAST 1464   43,3757    0 4574 C  UPERROR  TC     POSTJUMP       TURN ON 'OPERATOR ERROR' LIGHT
0210   REF   1              43,3760     57716 C         CADR   UPERRCUT +2     GO TO COMMON UPDATE PROGRAM EXIT

0211   REF 281  LAST 1452        4714              UP70     EQUALS ZERO
0212   REF 176  LAST 1464        4712              UP71     EQUALS ONE
0213   REF  8C  LAST 1464        4711              UP72     EQUALS TWO
0214   REF  53  LAST 144E        6214              UP73     EQUALS THREE


0215                         04,3645                        BANK   04
0216   REF   2  LAST 129E   27,2000                        SETLOC UPDATE2
0217                         27,3335                        BANK

0218   REF   1                                              COUNT* $$/P27

0219                         27,3335           UPPART2  EQUALS                UPDATE PROGRAM - PART 2

0220   REF 103  LAST 141C   27,3335    0 5301 C          TC     PHASCHNG       SET RESTART GROUP 6 TO RESTORE OLD MODE
0221                         27,3336     07026 1          OCT    07026          AND DOWNLIST AND EXIT IF RESTART OCCURS.
0222                         27,3337     30000 1          OCT    30000          PRIORITY SAME AS CHRPRIO
0223   REF   7  LAST  172        0304                      EBANK= UPBUFF
0224   REF   1              27,3340    03646 C           2CADR  UPOUT +1
0224   REF   1              27,3341    56100 C

0225   REF 177  LAST 1464   27,3342    3 4712 1          CAF    ONE
0226   REF   7  LAST 1064   27,3343   54 332 1           TS     DNLSTCOD       DOWNLIST

0227   REF  13  LAST  751   27,3344    0 5243 1          TC     NEWMODEX       SET MAJOR MODE = 27
0228                         27,3345     00033 1          DEC    27
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L UPDATE PROGRAM USER'S PAGE NO. 5 E3 S4

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0229  REF   3  LAST 1464   27,3346  50 3C2 C          INDEX  UPVERB     BRANCH DEPENDING ON WHETHER THE UPDATE
0230                       27,3347   1 3350 C          TCF    +1         VERB REQUIRES A FIXED OR VARIABLE NUMBER
0231                       27,3350   1 3353 C          TCF    +3         V70 FIXED.                (OF COMPONENTS.
0232  REF   1              27,3351   1 3356 C          TCF    OHWELL1    V71 VARIABLE - GO GET NO. OF COMPONENTS
0233  REF   2  LAST 1465  27,3352   1 3356 C          TCF    OHWELL1    V72 VARIABLE - GO GET NO. OF COMPONENTS
0234  REF  81  LAST 1464  27,3353   3 4711 1          CA     TWO        V73 (AND V70) FIXED
0235  REF   4  LAST  172  27,3354  54 3C0 C          TS     COMPNUMB   SET NUMBER OF COMPONENTS TO 2.
0236  REF   1              27,3355   1 3401 C          TCF    OHWELL2    GO GET THE TWO UPDATE COMPONENTS

0237  REF   1              27,3356   3 3451 1  OHWELL1 CAF    ADUPBUFF   * REQUEST USER TO SEND NUMBER  *
0238  REF 727  LAST 1448   27,3357  54 156 1           TS     MPAC +2    * OF COMPONENTS PARAMETER(II). *
0239  REF   1              27,3360   3 3452 1    +2     CAF    UPLOADNV   (CK4V32 RETURNS HERE IF V32 ENCOUNTERED)
0240  REF 249  LAST 1459   27,3361   0 4555 C           TC     BANKCALL   DISPLAY A FLASHING V21N01
0241  REF  13  LAST  621   27,3362     20465 1          CADR   GOXDSPF    TO REQUEST II.
0242  REF   1              27,3363   1 3646 1          TCF    UPOUT4     V34 TERMINATE UPDATE(P27) RETURN
0243  REF   3  LAST 1465  27,3364   1 3360 C          TCF    OHWELL1 +2
0244  REF   1              27,3365   0 3442 C          TC     CK4V32     DATA OR V32 RETURN
0245  REF  46  LAST 1359   27,3366   4 4711 C          CS     BIT2
0246  REF   8  LAST 1464  27,3367   6 0304 C          AD     UPBUFF     IS II(NUMBER OF COMPONENTS PARAMETER)
0247                       27,3370   0 0006 1          EXTEND            .GE. 3 AND .LE. 20D.
0248  REF   4  LAST 1465  27,3371   6 3360 1          BZMF   OHWELL1 +2
0249  REF   9  LAST 1465  27,3372   4 0304 1          CS     UPBUFF
0250  REF   1              27,3373   6 4376 1          AD     UP21
0251                       27,3374   0 0006 1          EXTEND
0252  REF   5  LAST 1465  27,3375   6 3360 1          BZMF   OHWELL1 +2
0253  REF  10  LAST 1465  27,3376  30 3C4 C          CAE    UPBUFF
0254  REF   5  LAST 1465  27,3377  54 3C0 C          TS     COMPNUMB   SAVE II IN COMPNUMB
```

RQ257 UPBUFF LOADING SEQUENCE

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02571 REF   3  LAST 1464   27,3400  24 303 1          INCR   UPCOUNT    INCREMENT COUNT OF COMPONENTS RECEIVED.
0258  REF   1              27,3401   3 3616 0  OHWELL2 CAF    ADUPBFM1   CALCULATE LOCATION(ECADR) IN UPBUFF
0259  REF   4  LAST 1465  27,3402   6 0303 1          AD     UPCOUNT    WHERE NEXT COMPONENT SHOULD BE STORED.
0260  REF 728  LAST 1465  27,3403  54 156 1    +2     TS     MPAC +2    PLACE ECADR INTO R3.
0261  REF   2  LAST 1465  27,3404   3 3452 1    +3     CAF    UPLOADNV   (CK4V32 RETURNS HERE IF V32 ENCOUNTERED)
0262  REF 250  LAST 1465  27,3405   0 4555 C           TC     BANKCALL   DISPLAY A FLASHING V21N01
0263  REF  14  LAST 1465  27,3406     20465 1          CADR   GOXDSPF    TO REQUEST DATA.
0264  REF   2  LAST 1465  27,3407   1 3646 1          TCF    UPOUT4     V34 TERMINATE UPDATE(P27) RETURN.
0265  REF   2  LAST 1465  27,3410   1 3404 C          TCF    OHWELL2 +3 V33 PROCEED RETURN
0266  REF   2  LAST 1465  27,3411   0 3442 C          TC     CK4V32     DATA OR V32 RETURN
0267  REF   5  LAST 1465  27,3412   4 0303 C          CS     UPCOUNT    HAVE WE FINISHED RECEIVING ALL
0268  REF   6  LAST 1465  27,3413   6 0300 1          AD     COMPNUMB   THE DATA WE EXPECTED.
0269                       27,3414   0 0006 1          EXTEND
0270  REF   1              27,3415   6 3417 C          BZMF   UPVERIFY   YES- GO TO VERIFICATION SEQUENCE
0272  REF   3  LAST 1465  27,3416   1 3400 1          TCF    OHWELL2 -1 NO- REQUEST ADDITIONAL DATA.
```

RQ273 VERIFY SEQUENCE

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0274  REF   1                27,3417  3 3450 C  UPVERIFY CAF    ADUPTEMP      PLACE ECADR WHERE COMPONENT NO. INDEX
0275  REF 729  LAST 1465     27,3420  54 156 1            TS     MPAC +2       IS TO BE STORED INTO R3.
0276  REF   1                27,3421  3 3453 C            CAF    UPVRFYNV      (CK4V32 RETURNS HERE IF V32 ENCOUNTERED)
0277  REF 251  LAST 1465     27,3422  0 4555 C            TC     BANKCALL      DISPLAY A FLASHING V21N02 TO REQUEST
0278  REF  15  LAST 1465     27,3423   20465 1            CADR   GOXDSPF       DATA CORRECTION OR VERIFICATION.
0279  REF   3  LAST 1465     27,3424  1 3646 1            TCF    UPOUT4        V34 TERMINATE UPDATE(P27) RETURN
0280  REF   1                27,3425  1 3454 C            TCF    UPSTORE       V33 DATA SENT IS GOOD. GO STORE IT.
0281  REF   3  LAST 1465     27,3426  0 3442 C            TC     CK4V32        COMPONENT NO. INDEX OR V32 RETURN
0282  REF   2  LAST   69     27,3427  3 0330 1            CA     UPTEMP        DOES THE COMPONENT NO. INDEX JUST SENT
0283                          27,3430  0 0006 1            EXTEND               SPECIFY A LEGAL COMPONENT NUMBER?
0284  REF   2  LAST 1465     27,3431  6 3417 C            BZMF   UPVERIFY      NO, IT IS NOT POSITIVE NONZERO
0285  REF   3  LAST 1466     27,3432  4 0330 C            CS     UPTEMP
0288  REF   7  LAST 1465     27,3433  6 0300 1            AD     COMPNUMB
0289  REF  83  LAST 1459     27,3434  6 4712 1            AD     BIT1
0290                          27,3435  0 0006 1            EXTEND
0291  REF   3  LAST 1466     27,3436  6 3417 C            BZMF   UPVERIFY      NO
0292  REF   2  LAST 1465     27,3437  3 3616 C            CAF    ADUPBFM1      YES- BASED ON THE COMPONENT NO. INDEX
0293  REF   4  LAST 1466     27,3440  6 0330 1            AD     UPTEMP        CALCULATE THE ECADR OF LOCATION IN
0294  REF   4  LAST 1465     27,3441  1 3403 1            TCF    CHWELL2 +2    UPBUFF WHICH USER WANTS TO CHANGE.

0295  REF   2  LAST 1464     27,3646            UPOUT4   EQUALS UPOUT +1       COMES HERE ON V34 TO TERMINATE UPDATE


R0296                 CHECK FOR VERB 32 SEQUENCE

0297  REF 730  LAST 1466     27,3442  4 0154 C  CK4V32   CS     MPAC          ON DATA RETURN FROM 'GOXDSPF'
0298  REF  59  LAST 1459     27,3443  7 4705 C            MASK   BIT6          ON DATA RETURN FROM "GOXDSP"& THE CON-
0299  REF 421  LAST 1464     27,3444  10 000 0            CCS    A             TENTS OF MPAC = VERB.  SO TEST FOR V32.
0300  REF 361  LAST 1464     27,3445  0 0002 C            TC     Q             IT'S NOT A V32, IT'S DATA.  PROCEED.
0301  REF 362  LAST 1466     27,3446  50 002 C            INDEX  Q
0302                          27,3447  7'7771 C            TC     0 -6          V32 ENCOUNTERED - GO BACK AND GET DATA

0305  REF   5  LAST 1466     27,3450    00330 1  ADUPTEMP ADRES  UPTEMP        ADDRESS OF TEMP STORAGE FOR CORRECTIONS
0306  REF  11  LAST 1465     27,3451    00304 C  ADUPBUFF ADRES  UPBUFF        ADDRESS OF UPDATE DATA STORAGE BUFFER
0307                          27,3452    05201 1  UPLOADNV VN     2101          VERB 21 NOUN 01
0308                          27,3453    05202 1  UPVRFYNV VN     2102          VERB 21 NOUN 02
0309  REF   3  LAST 1171        4376             UP21     =      MD1           DEC 21 = MAX NO OF COMPONENTS +1
03121 REF  29  LAST 1431        4715             UPDTPHAS EQUALS FIVE

R0313                 PRE-STORE AND FAN TO APPROPRIATE BRANCH SEQUENCE

0314                          27,3454            UPSTORE  EQUALS               GROUND HAS VERIFIED UPDATE. STORE DATA.

0315                          27,3454  0 0004 0            INHINT

0316  REF  26  LAST 1459     27,3455  30 103 C            CAE    FLAGWRD7      INVERT VERIFLAG(BIT3 OF FLAGWRD7) TO
0317  REF 249  LAST 1460     27,3456  56 001 0            XCH    L             INDICATE TO THE GROUND(VIA DOWNLINK)
0318  REF  39  LAST 1444     27,3457  3 4710 C            CAF    BIT3          THAT THE V33(WHICH THE GROUND SENT TO
0319                          27,3460  0 0006 1            EXTEND               VERIFY THE UPDATE) HAS BEEN SUCCESSFULLY
0320  REF  17  LAST 1450     27,3461  06 001 C            RXOR   LCHAN         RECEIVED BY THE UPDATE PROGRAM
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```
0321   REF  27  LAST 1466   27,3462  54 1C3 1            TS      FLAGWRD7

0322   REF 1C4  LAST 1464   27,3463  0 5301 C            TC      PHASCHNG        SET RESTART GROUP 6 TO REDO THE UPDATE
0323                        27,3464   04026 1            OCT     04026           DATA STORE IF A RESTART OCCURS.
0324                        27,3465  0 0004 0            INHINT                  (BECAUSE PHASCHNG DID A RELINT)

0325   REF  82  LAST 1465   27,3466  4 4711 C            CS      TWO             GO TO UPFNDVAC IF INSTALL IS REQUIRED,
0326   REF   4  LAST 1465   27,3467  6 0302 C            AD      UPVERB          THAT IS, IF IT'S A V70 - V72.
0327                        27,3470  0 0006 1            EXTEND                  GO TO UPEND73 IF IT'S A V73.
0328   REF   1              27,3471  6 3500 1            BZMF    UPFNDVAC

R0330                VERB 73 BRANCH

0331                        27,3472  0 0006 1  UPEND73    EXTEND                  V73-PERFORM DP OCTAL AGC CLOCK INCREMENT
0332   REF  12  LAST 1466   27,3473  3 0305 1            DCA     UPBUFF
0333   REF  13  LAST 1467   27,3474  52 315 1            DXCH    UPBUFF +8D
0334   REF   1              27,3475  0 3523 C            TC      TIMECIDL
0335   REF   7  LAST  356   27,3476  0 4400 1            TC      FALTON          ERROR- TURN ON *OPERATOR ERROR* LIGHT
0336   REF   3  LAST 1466   27,3477  0 3646 C            TC      UPOUT +1        GO TO COMMON UPDATE PROGRAM EXIT

0337   REF   7  LAST 1413   27,3500  3 4371 0  UPFNDVAC  CAF     CHRPRIO         (USE EXTENDED VERB PRIORITY)
0338   REF  34  LAST 1442   27,3501  0 5042 1            TC      FINDVAC         GET VAC AREA FOR 'CALL INTSTALL'
0339   REF  14  LAST 1463   E3,1706                      EBANK=  TEPHEM
0340   REF   1              27,3502   03505 1            2CADR   UPJOB           (NOTE: THIS WILL ALSO SET EBANK FOR
0340   REF   1              27,3503   56103 0
0341   REF 121  LAST 1459   27,3504  0 5112 C            TC      ENDOFJOB        'TEPHEM' UPDATE BY V70)

0342   REF 246  LAST 1332   27,3505  0 6006 1  UPJOB     TC      INTPRET         THIS COULD BE A STATE VECTOR UPDATE--SO
0343                        27,3506   77624 1            CALL                    WAIT(PUT JOB TO SLEEP) IF ORBIT INT(OI)
0344   REF  32  LAST 1294   27,3507   27371 1                    INTSTALL        IS IN PROGRESS--OR--GRAB OI AND RETURN
A0345                                                                           TO UPWAKE IF OI IS NOT IN PROGRESS.

0346                        27,3510   77776 1  UPWAKE     EXIT

0347   REF 105  LAST 1467   27,3511  0 5301 C            TC      PHASCHNG        RESTART PROTECT(GROUP 6)
0348                        27,3512   04026 1            OCT     04026

0350   REF  55  LAST 144C   27,3513  0 5435 C            TC      UPFLAG          SET INTEGRATION RESTART BIT
0351   REF   5  LAST 1313   27,3514   00236 C            ADRES   REINTFLG
0352                        27,3515  0 0004 C            INHINT
0355                        27,3516              UPPART3 EQUALS

0356   REF   5  LAST 1467   27,3516  50 302 C            INDEX   UPVERB          BRANCH TO THE APPROPRIATE UPDATE VERB
0357                        27,3517  1 3520 1            TCF     +1              ROUTINE TO ACTUALLY PERFORM THE UPDATE
0358   REF   1              27,3520  1 3657 1            TCF     UPEND70         V70
0359   REF   1              27,3521  1 3566 C            TCF     UPEND71         V71
0360   REF   1              27,3522  1 3620 1            TCF     UPEND72         V72

R0361          ROUTINE TO INCREMENT CLOCK(TIME2,TIME1) WITH CONTENTS OF DP WORD AT UPBUFF.
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0363                              27,3523  0 0006 1  TIMEDIDL EXTEND
0364  REF   6  LAST 1466         27,3524  22 330 1            QXCH  UPTEMP      SAVE Q FOR RETURN
0365  REF 282  LAST 1464         27,3525  3 4714 1            CAF   ZERO       ZERO AND SAVE TIME2,TIME1
0366                              27,3526  22 007 C            ZL
0367  REF  34  LAST 1412         27,3527  52 025 1            DXCH  TIME2
0368  REF  14  LAST 1467         27,3530  52 327 C            DXCH  UPBUFF +18D STORE IN CASE OF OVERFLOW

0369  REF   1                     27,3531  3 4715 C            CAF   UPDTPHAS    DO
0370  REF 250  LAST 1466         27,3532  54 0C1 1            TS    L           A
0371                              27,3533  4 0000 C            COM               QUICK
03711 REF   3  LAST  649         27,3534  52 765 1            DXCH  -PHASE6     PHASCHNG

0372                              27,3535  0 0004 C  TIMEDIDR INHINT

0373  REF 283  LAST 1468         27,3536  3 4714 1            CAF   ZERO
0374                              27,3537  22 007 C            ZL                PICK UP INCREMENTER(AND ZERO
0375  REF 731  LAST 1466         27,3540  54 156 1            TS    MPAC +2     IT IN CASE OF RESTARTS) AND
0376  REF  15  LAST 1468         27,3541  52 315 1            DXCH  UPBUFF +8D  STORE IT
0377  REF 732  LAST 1468         27,3542  52 155 1            DXCH  MPAC        INTO MPAC FOR TPAGREE.

0378                              27,3543  0 0006 1            EXTEND
0379  REF  16  LAST 1468         27,3544  3 0327 1            DCA   UPBUFF +18D
0380  REF 733  LAST 1468         27,3545  20 155 1            DAS   MPAC        FORM SUM IN MPAC
0381                              27,3546  0 0006 1            EXTEND
0382  REF   1                     27,3547  1 3556 C            BZF   DELTATCK    TEST FOR OVERFLOW
0383  REF 284  LAST 1468         27,3550  3 4714 1            CAF   ZERO
0384  REF  17  LAST 1468         27,3551  52 327 C            DXCH  UPBUFF +18D OVERFLOW, RESTORE OLD VALUE OF CLOCK
0385  REF  35  LAST 1468         27,3552  20 025 1            DAS   TIME2       AND TURN ON OPERATOR ERROR

0386  REF 1C6  LAST 1467         27,3553  0 5301 C            TC    PHASCHNG    RESTART PROTECT(GROUP 6)
0387                              27,3554   04026 1            OCT   04026

0388  REF   7  LAST 1468         27,3555  0 0330 1            TC    UPTEMP      GO TC ERROR EXIT

0389  REF  14  LAST 1412         27,3556  0 7226 C  DELTATCK  TC    TPAGREE     FORCE SIGN AGREEMENT
0390  REF 734  LAST 1468         27,3557  52 155 1            DXCH  MPAC
0391  REF  3E  LAST 1468         27,3560  20 025 1            DAS   TIME2       INCREMENT TIME2,TIME1

0392  REF 1C7  LAST 1468         27,3561  0 5301 C            TC    PHASCHNG    RESTART PROTECT(GROUP 6)
0393                              27,3562   04026 1            OCT   04026

0394                              27,3563  0 0004 C            INHINT
0395  REF   8  LAST 1468         27,3564  5C 330 1            INDEX UPTEMP      (CODED THIS WAY FOR RESTART PROTECTION)
0396                              27,3565  0 0001 C            TC    1           NORMAL RETURN
R0397           VERB 71 BRANCH

0402  REF  18  LAST 1468         27,3566  30 305 1  UPBN071   CAE   UPBUFF +1   SET EBANK
0403  REF  66  LAST 1439         27,3567  54 003 C            TS    EBANK           AND
0404  REF  17  LAST 1399         27,3570  7 4373 C            MASK  LOW8        CALCULATE
0405  REF   9  LAST 1468         27,3571  54 330 C            TS    UPTEMP      S-REG VALUE OF RECEIVING AREA
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0406  REF   5  LAST 1395  27,3572  6 7714 1          AD      NEG3        IN THE PROCESS OF
0407  REF   8  LAST 1466  27,3573  6 0300 1          AD      COMPNUMB    PERFORMING
0408                       27,3574  0 0006 1          EXTEND              THIS UPDATE
0409  REF   1              27,3575  1 3603 0          BZF     STORLP71    WILL WE
0410  REF  39  LAST 1431  27,3576  7 4702 1          MASK    BIT9        OVERFLOW
0411  REF 422  LAST 1466  27,3577  10 000 0          CCS     A           INTO THE NEXT EBANK....
0412  REF   2  LAST 1464  27,3600  1 3714 1          TCF     UPERROUT    YES

0413  REF   6  LAST 1469  27,3601  3 7714 1          CA      NEG3        NO- CALCULATE NUMBER OF
0414  REF   9  LAST 1469  27,3602  6 0300 1          AD      COMPNUMB    WORDS TO BE STORED MINUS ONE
0415  REF 735  LAST 1468  27,3603  54 154 0  STORLP71 TS      MPAC        SAVE NO. OF WORDS REMAINING MINUS ONE
0416  REF 423  LAST 1469  27,3604  50 000 1          INDEX   A           TAKE NEXT UPDATE WORD FROM
0417  REF  19  LAST 1468  27,3605  3 0306 1          CA      UPBUFF +2   UPBUFF AND
0418  REF 251  LAST 1468  27,3606  54 001 1          TS      L           SAVE IT IN L
0419  REF 736  LAST 1469  27,3607  3 0154 1          CA      MPAC        CALCULATE NEXT
0420  REF  10  LAST 1468  27,3610  6 0330 1          AD      UPTEMP      RECEIVING ADDRESS
0421  REF 424  LAST 1469  27,3611  50 000 1          INDEX   A
0422                       E3,1400                   EBANK=  1400
0423                       27,3612  23'400 1         LXCH    1400        UPDATE THE REGISTER  BY CONTENTS OF L
0424  REF  15  LAST 1467  E3,1706                   EBANK=  TEPHEM
0425  REF 737  LAST 1469  27,3613  10 154 0          CCS     MPAC        ARE THERE ANY WORDS LEFT TO BE STORED
0426  REF   2  LAST 1469  27,3614  1 3603 0          TCF     STORLP71    YES
0427  REF   4  LAST 1467  27,3615  1 3645 1          TCF     UPOUT       NO- THEN EXIT UPDATE PROGRAM
0428  REF  20  LAST 1469  27,3616   00303 1  ADUPBFM1 ADRES   UPBUFF -1   SAME AS ADUPBUFF BUT LESS 1 (DON'T MOVE)
0429  REF   5  LAST 1469  27,3617  1 3645 1          TCF     UPOUT       NO- EXIT UPDATE(HERE WHEN COMPNUMB = 3)

RC430                VERB 72 BRANCH

0431  REF  84  LAST 1466  27,3620  3 4712 1  UPEND72 CAF     BIT1        HAVE AN ODD NO. OF COMPONENTS
0432  REF  10  LAST 1469  27,3621  7 0300 0          MASK    COMPNUMB    BEEN SENT FOR A V72 UPDATE...
0433  REF 425  LAST 1469  27,3622  10 000 0          CCS     A
0434                       27,3623  1 3625 1          TCF     +2          YES
0435  REF   3  LAST 1469  27,3624  1 3714 1          TCF     UPERROUT    ERROR- SHOULD BE ODD NO. OF COMPONENTS
0451  REF  47  LAST 1469  27,3625  4 4711 0          CS      BIT2
0452  REF  11  LAST 1469  27,3626  6 0300 1          AD      COMPNUMB
0453  REF 738  LAST 1469  27,3627  54 154 0  LDLOOP72 TS      MPAC        NOW PERFORM THE UPDATE
0454  REF 426  LAST 1469  27,3630  50 000 1          INDEX   A
0455  REF  21  LAST 1469  27,3631  30 305 1          CAE     UPBUFF +1   PICK UP NEXT UPDATE WORD
0456  REF 427  LAST 1469  27,3632  22 000 1          LXCH    A
0457  REF 739  LAST 1469  27,3633  10 154 0          CCS     MPAC        SET POINTER TO ECADR(MUST BE CCS)
0458  REF 740  LAST 1469  27,3634  54 154 0          TS      MPAC
0459  REF 428  LAST 1469  27,3635  50 000 1          INDEX   A
0460  REF  22  LAST 1469  27,3636  30 305 1          CAE     UPBUFF +1   PICK UP NEXT ECADR OF REG TO BE UPDATED
0461  REF  67  LAST 1468  27,3637  54 003 0          TS      EBANK       SET EBANK
0462  REF  18  LAST 1468  27,3640  7 4373 0          MASK    LOW8        ISOLATE RELATIVE ADDRESS
0463  REF 429  LAST 1469  27,3641  50 000 1          INDEX   A
0464                       E3,1400                   EBANK=  1400
0465                       27,3642  23'400 1         LXCH    1400        UPDATE THE REGISTER BY CONTENTS OF L
0466  REF  16  LAST 1469  E3,1706                   EBANK=  TEPHEM
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0467   REF 741  LAST 1465   27,3643  10 154 C          CCS    MPAC          ARE WE THROUGH THE V72 UPDATE...
0468   REF   1               27,3644  1 3627 C          TCF    LDLOCP72      NO

R0469          NORMAL FINISH OF P27

0470                         27,3645                   UPOUT  EQUALS
0471   REF   1               27,3645  0 2633 C                 TC     INTWAKEU      RELEASE  GRAB  OF ORBITAL INTEGRATION
0472   REF   3  LAST 1463    27,3646  30 301 C  +1             CAE    UPOLDMOD      RESTORE PRIOR P27 MODE
0473   REF  14  LAST 1464    27,3647  0 5246 1                 TC     NEWMODEX +3
0474   REF 285  LAST 1468    27,3650  3 4714 1                 CAF    ZERO
0475   REF   8  LAST 1464    27,3651  54 332 1                 TS     DNLSTCOD
0476   REF   3  LAST  581    27,3652  0 3721 C                 TC     UPACTOFF      TURN OFF 'UPLINK ACTIVITY' LIGHT

0477                         27,3653  0 0006 1                 EXTEND                KILL GROUP 6.
0478   REF  17  LAST 1388    27,3654  3 4714 1                 DCA    NEGO
0479   REF   4  LAST 1468    27,3655  52 765 1                 DXCH   -PHASE6

0480   REF  38  LAST  888    27,3656  0 5423 1                 TC     ENDEXT        EXTENDED VERB EXIT

R0481          VERB 70 BRANCH

0482                         27,3657  0 0006 1  UPEND70  EXTEND                     V70 DOES THE FOLLOWING WITH DP DELTA
0483   REF  23  LAST 1469    27,3660  4 0305 C          DCS    UPBUFF        TIME IN UPBUFF
0484   REF  24  LAST 1470    27,3661  52 315 1          DXCH   UPBUFF +8D
0485   REF   2  LAST 1467    27,3662  0 3523 C          TC     TIMEDIDL      DECREMENT AGC CLOCK

0486   REF   4  LAST 1469    27,3663  0 3714 C          TC     UPERROUT      ERROR WHILE DECREMENTING CLOCK -- EXIT

0487   REF  17  LAST 1469    E3,1706                    EBANK= TEPHEM
0488                         27,3664  0 0006 1          EXTEND
0489   REF  25  LAST 1470    27,3665  4 0305 C          DCS    UPBUFF        COPY DECREMENTERS FOR
0490   REF  26  LAST 1470    27,3666  52 317 C          DXCH   UPBUFF +10D   RESTART PROTECTION
0491                         27,3667  0 0006 1          EXTEND
0492   REF  27  LAST 1470    27,3670  4 0305 C          DCS    UPBUFF
0493   REF  28  LAST 1470    27,3671  52 321 C          DXCH   UPBUFF +12D

0494   REF 108  LAST 1468    27,3672  0 5301 C          TC     PHASCHNG      RESTART PROTECT(GROUP 6)
0495                         27,3673   04026 1          OCT    04026

0496   REF 286  LAST 1470    27,3674  3 4714 1          CAF    ZERO
0497                         27,3675  22 007 C          ZL
0498   REF  29  LAST 1470    27,3676  52 317 C          DXCH   UPBUFF +10D   DECREMENT CSM STATE VECTOR TIME
0499   REF   3  LAST  203    27,3677  21'571 1          DAS    TETCSM

0500   REF 287  LAST 1470    27,3700  3 4714 1          CAF    ZERO
0501                         27,3701  22 007 C          ZL
0502   REF  30  LAST 1470    27,3702  52 321 C          DXCH   UPBUFF +12D   DECREMENT LEM STATE VECTOR TIME
0503   REF   3  LAST   83    27,3703  21'643 C          DAS    TETLEM
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0504  REF 288  LAST 147C  27,3704  3 4714 1          CAF     ZERO
0505                      27,3705  22 007 C          ZL
0506  REF  31  LAST 147C  27,3706  52 305 C          DXCH    UPBUFF
0507  REF  18  LAST 147C  27,3707  21'710 1         DAS     TEPHEM +1       INCREMENT TP TEPHEM
0508  REF  19  LAST 1471  27,3710  27'706 C         ADS     TEPHEM

0509  REF 1C9  LAST 147C  27,3711  0 5301 C         TC      PHASCHNG        RESTART PROTECT(GROUP 6)
0510                      27,3712   04026 1         OCT     04026

0511  REF  32  LAST 1471     0304                   EBANK=  UPBUFF

0512  REF   6  LAST 1469  27,3713  0 3645 C         TC      UPOUT           GO TO STANDARD UPDATE PROGRAM EXIT


R0513           ERROR SEQUENCE

0514  REF   8  LAST 1467  27,3714  0 4400 1  UPERRCUT TC     FALTON          TURN ON *OPERATOR ERROR* LIGHT
0515  REF   7  LAST 1471  27,3715  1 3645 1          TCF     UPOUT           GO TO COMMON UPDATE PROGRAM EXIT

0516  REF   9  LAST 1471  27,3716  0 4400 1  +2      TC      FALTON          TURN ON 'OPERATOR ERROR' LIGHT
0517  REF   4  LAST 147C  27,3717  0 3721 C          TC      UPACTOFF        TURN OFF'UPLINK ACTIVITY'LIGHT
0518  REF  39  LAST 147C  27,3720  0 5423 1          TC      ENDEXT          EXTENDED VERB EXIT
A0519                                                                       (THE PURPOSE OF UPERROUT +2 EXIT IS
A0520                                                                       TO PROVIDE AN ERROR EXIT WHICH DOES NOT
A0521                                                                       RESET ANY RESTART GROUPS)
A0522


R0523           :UPACTOFF: IS A ROUTINE TC TURN OFF UPLINK ACTIVITY LIGHT ON ALL EXITS FROM UPDATE PROGRAM(P27).

0525  REF  40  LAST 1466  27,3721  4 4710 1  UPACTOFF CS     BIT3
0527                      27,3722  0 0006 1          EXTEND
0528  REF  36  LAST 1442  27,3723  03 011 1          WAND    DSALMOUT        TURN OFF UPLINK ACTIVITY LIGHT
0530  REF 363  LAST 1466  27,3724  0 0002 C          TC      Q               (BIT 3 OF CHANNEL 11)
```

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0001                          22,3505                    BANK   22
0002  REF   1                 22,2000                    SETLOC RTBOPCODES
0003                          22,3505                    BANK

0004  REF  13  LAST 1323      E5,1713                    EBANK= XNB
0005  REF   1                                            COUNT* $$/RTB

R0006           LOAD TIME2, TIME1 INTO MPAC:

0007                          22,3505  0 0006 1  LOADTIME EXTEND
0008  REF  37  LAST 146E      22,3506  3 0025 C           DCA    TIME2
0009  REF   2  LAST 1091      22,3507  1 6024 C           TCF    SLOAD2

R0010           CONVERT THE SINGLE PRECISION 2'S COMPLEMENT NUMBER ARRIVING IN MPAC (SCALED IN HALF-REVOLUTIONS) TO A
R0012  DP 1'S COMPLEMENT NUMBER SCALED IN REVOLUTIONS.

0016  REF 742  LAST 1470      22,3510  10 154 C  CDULOGIC CCS    MPAC
0017  REF 289  LAST 1471      22,3511  3 4714 1           CAF    ZERO
0018                          22,3512  1 3515 1           TCF    +3
0019                          22,3513  13 514 C           NOOP
0020  REF  25  LAST 1174      22,3514  4 4675 C           CS     HALF

0021  REF 743  LAST 1472      22,3515  54 155 1           TS     MPAC +1
0022  REF 290  LAST 1472      22,3516  3 4714 1           CAF    ZERO
0023  REF 744  LAST 1472      22,3517  56 154 1           XCH    MPAC
0024                          22,3520  0 0006 1           EXTEND
0025  REF  26  LAST 1472      22,3521  7 4675 C           MP     HALF
0026  REF 745  LAST 1472      22,3522  20 155 1           DAS    MPAC
0027  REF  68  LAST 1351      22,3523  1 6030 C           TCF    DANZIG          MODE IS ALREADY AT DOUBLE-PRECISION

R0040           READ THE PIPS INTO MPAC WITHOUT CHANGING THEM:

0041                          22,3524  0 0004 C  READPIPS INHINT
0042  REF  14  LAST 1393      22,3525  3 0037 C           CA     PIPAX
0043  REF 746  LAST 1472      22,3526  54 154 C           TS     MPAC
0044  REF   5  LAST 1393      22,3527  3 0040 C           CA     PIPAY
0045  REF 747  LAST 1472      22,3530  54 157 C           TS     MPAC +3
0046  REF   8  LAST 1393      22,3531  3 0041 1           CA     PIPAZ
0047                          22,3532  0 0003 1           RELINT
0048  REF 748  LAST 1472      22,3533  54 161 C           TS     MPAC +5

0049  REF 291  LAST 1472      22,3534  3 4714 1           CAF    ZERO
0050  REF 749  LAST 1472      22,3535  54 155 1           TS     MPAC +1
0051  REF 750  LAST 1472      22,3536  54 160 1           TS     MPAC +4
0052  REF 751  LAST 1472      22,3537  54 162 C           TS     MPAC +6

0053  REF   3  LAST 1149      22,3540  1 6470 0  VECMODE   TCF    VMODE
R0054           FORCE TP SIGN AGREEMENT IN MPAC:

0055  REF  15  LAST 1468      22,3541  0 7226 C  SGNAGREE TC     TPAGREE
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0056   REF  65  LAST 1472   22,3542  1 6030 C            TCF    DANZIG

R0057              CONVERT THE DP 1'S COMPLEMENT ANGLE SCALED IN REVOLUTIONS TO A SINGLE PRECISION 2'S COMPLEMENT ANGLE
R0059   SCALED IN HALF-REVOLUTIONS.

0060   REF   1              22,3543  0 3573 C  1STO2S  TC     1TO2SUB
0061   REF 252  LAST 1472   22,3544  3 4714 1          CAF    ZERO
0062   REF 752  LAST 1472   22,3545  54 155 1          TS     MPAC +1
0063   REF   5  LAST 1115   22,3546  1 6027 C          TCF    NEWMODE

R0064              DC 1STO2S ON A VECTOR OF ANGLES:

0065   REF   2  LAST 1473   22,3547  0 3573 C  V1STO2S  TC     1TO2SUB       ANSWER ARRIVES IN A AND MPAC.

0066   REF 753  LAST 1473   22,3550  52 162 C          DXCH   MPAC +5
0067   REF 754  LAST 1473   22,3551  52 155 1          DXCH   MPAC
0068   REF   3  LAST 1473   22,3552  0 3573 C          TC     1TO2SUB
0069   REF 755  LAST 1473   22,3553  54 156 1          TS     MPAC +2

0070   REF 756  LAST 1473   22,3554  52 160 1          DXCH   MPAC +3
0071   REF 757  LAST 1473   22,3555  52 155 1          DXCH   MPAC
0072   REF   4  LAST 1473   22,3556  0 3573 C          TC     1TO2SUB
0073   REF 758  LAST 1473   22,3557  54 155 1          TS     MPAC +1

0074   REF 759  LAST 1473   22,3560  3 0161 1          CA     MPAC +5
0075   REF 760  LAST 1473   22,3561  54 154 C          TS     MPAC

0076   REF 178  LAST 1464   22,3562  3 4712 1  TPMODE   CAF    ONE           MODE IS TP.
0077   REF   6  LAST 1473   22,3563  1 6027 C          TCF    NEWMODE

R0078              V1STO2S FOR 2 COMPONENT VECTOR. USED BY RR.

0079   REF   5  LAST 1473   22,3564  0 3573 C  2V1STO2S TC     1TO2SUB
0080   REF 761  LAST 1473   22,3565  52 160 1          DXCH   MPAC +3
0081   REF 762  LAST 1473   22,3566  52 155 1          DXCH   MPAC
0082   REF   6  LAST 1473   22,3567  0 3573 C          TC     1TO2SUB
0083   REF 252  LAST 1465   22,3570  54 001 1          TS     L
0084   REF 763  LAST 1473   22,3571  3 0157 1          CA     MPAC +3
0085   REF   3  LAST 1472   22,3572  1 6024 C          TCF    SLOAD2

R0086              SUBROUTINE TO DO DOUBLING AND 1'S TO 2'S CONVERSION:

0087   REF 764  LAST 1473   22,3573  52 155 1  1TO2SUB  DXCH   MPAC          FINAL MPAC +1 UNSPECIFIED.
0088                        22,3574  20 001 1          DDOUBL
0089   REF 430  LAST 1465   22,3575  10 000 C          CCS    A
0090   REF 179  LAST 1473   22,3576  6 4712 1          AD     ONE
0091                        22,3577  1 3601 1          TCF    +2
0092                        22,3600  4 0000 C          COM                  THIS WAS REVERSE OF MSU.

0093   REF 765  LAST 1473   22,3601  54 154 C          TS     MPAC          AND SKIP ON OVERFLOW.
```

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0094   REF 364  LAST 1471   22,3602  0 0002 0          TC     Q

0095   REF 431  LAST 1473   22,3603  50 000 1          INDEX  A          OVERFLOW UNCORRECT AND IN MSU.
0096   REF   6  LAST 1174   22,3604  3 4673 1          CAF    LIMITS
0097   REF 766  LAST 1473   22,3605  26 154 0          ADS    MPAC
0098   REF 365  LAST 1474   22,3606  0 0002 0          TC     Q
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P0099            SUBROUTINE TO INCREMENT CDUS
 0102   REF   1                22,3607  3 3622 1  INCRCDUS CAF    LOCTHETA
 0103   REF 127  LAST 1334     22,3610  54 130 1           TS     BUF          PLACE ADRES(THETA) IN BUF.
 0104   REF 767  LAST 1474     22,3611  30 154 1           CAE    MPAC         INCREMENT IN 1S COMPL.
 0105   REF   1                22,3612  0 3623 0           TC     CDUINC

 0106   REF 128  LAST 1475     22,3613  24 130 0           INCR   BUF
 0107   REF 768  LAST 1475     22,3614  30 157 1           CAE    MPAC +3
 0108   REF   2  LAST 1475     22,3615  0 3623 0           TC     CDUINC

 0109   REF 129  LAST 1475     22,3616  24 130 0           INCR   BUF
 0110   REF 769  LAST 1475     22,3617  30 161 1           CAE    MPAC +5
 0111   REF   3  LAST 1475     22,3620  0 3623 0           TC     CDUINC

 0112   REF   1                22,3621  1 3540 1           TCF    VECMCDE

 0113   REF  23  LAST 1388     22,3622   01155 1  LOCTHETA ADRES  THETAD

R0114            THE FOLLOWING ROUTINE INCREMENTS IN 2S COMPLEMENT THE REGISTER WHOSE ADDRESS IS IN BUF BY THE 1S COMPL.
R0116   QUANTITY FOUND IN TEM2. THIS MAY BE USED TO INCREMENT DESIRED IMU AND OPTICS CDU ANGLES OR ANY OTHER 2S COMPL.
R0118   (+0 UNEQUAL TO -0) QUANTITY. MAY BE CALLED BY BANKCALL/SWCALL.

 0119   REF   6  LAST 1330     22,3623  54 142 1  CDUINC   TS     TEM2         1S COMPL.QUANT. ARRIVES IN ACC. STORE IT
 0120   REF 130  LAST 1475     22,3624  50 130 0           INDEX  BUF
 0121                          22,3625  10 000 0           CCS    0            CHANGE 2S COMPL. ANGLE(IN BUF)INTO 1S
 0122   REF 180  LAST 1473     22,3626  6 4712 1           AD     ONE
 0123                          22,3627  1 3633 0           TCF    +4
 0124   REF 181  LAST 1475     22,3630  6 4712 1           AD     ONE
 0125   REF 182  LAST 1475     22,3631  6 4712 1           AD     ONE          OVERFLOW HERE IF 2S COMPL. IS 180 DEG.
 0126                          22,3632  4 0000 0           COM

 0127   REF   7  LAST 1475     22,3633  6 0142 0           AD     TEM2         SULT MOVES FROM 2ND TO 3D QUAD.(OR BACK)
 0129   REF 432  LAST 1474     22,3634  10 000 0           CCS    A            BACK TO 2S COMPL.
 0130   REF 183  LAST 1475     22,3635  6 4712 1           AD     ONE
 0131                          22,3636  1 3640 1           TCF    +2
 0132                          22,3637  4 0000 0           COM
 0133   REF   8  LAST 1475     22,3640  54 142 1           TS     TEM2         STORE 14BIT QUANTITY WITH PRESENT SIGN
 0134                          22,3641  1 3645 1           TCF    +4
 0135   REF 433  LAST 1475     22,3642  50 000 1           INDEX  A             SIGN.
 0137   REF   7  LAST 1474     22,3643  3 4673 1           CAF    LIMITS       FIX IT,BY ADDING IN 37777 OR 40000
 0138   REF   9  LAST 1475     22,3644  6 0142 0           AD     TEM2

 0139   REF 131  LAST 1475     22,3645  50 130 0           INDEX  BUF
 0140                          22,3646  54 000 0           TS     0            STORE NEW ANGLE IN 2S COMPLEMENT.
 0141   REF 366  LAST 1474     22,3647  0 0002 0           TC     Q
```

P0142 RTB TO TORQUE GYROS, EXCEPT FOR THE CALL TO IMUSTALL. ECADR OF COMMANDS ARRIVES IN X1.

```
0144   REF  41  LAST 1290   22,3650  50 120 1  PULSEIMU INDEX  FIXLOC          ADDRESS OF GYRO COMMANDS SHOULD BE IN X1
0145   REF  89  LAST 1340   22,3651  3 0046 C                  CA     X1
0146   REF 252  LAST 1466   22,3652  0 4555 C                  TC     BANKCALL
0147   REF   6  LAST  711   22,3653   17125 1                  CADR   IMUPULSE
0148   REF  70  LAST 1473   22,3654  1 6030 C                  TCF    DANZIG
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P0149   EACH ROUTINE TAKES A 3X3 MATRIX STORED IN DOUBLE PRECISION IN A FIXED AREA OF ERASABLE MEMORY AND REPLACES IT
R0151   WITH THE TRANSPOSE MATRIX. TRANSP1 USES LOCATIONS XNB+0,+1 THROUGH XNB+16D, 17D AND TRANSP2 USES LOCATIONS
R0153   XNB1+0,+1 THROUGH XNB1+16D, 17D. EACH MATRIX IS STORED BY ROWS.

 0154   REF  14  LAST 1472   22,3655   02713 0  XNBEB    ECADR  XNB
 0155   REF   5  LAST  280   22,3656   02554 1  XNB1EB   ECADR  XNB1

 0156   REF  15  LAST 1477   E5,1713                     EBANK= XNB

 0164   REF   1              22,3657   3 3655 1  TRANSP1  CAF    XNBEB
 0165   REF  68  LAST 1469   22,3660   54 003 0           TS     EBANK
 0166   REF  16  LAST 1477   22,3661   53'716 1           DXCH   XNB +2
 0167   REF  17  LAST 1477   22,3662   53'722 0           DXCH   XNB +6
 0168   REF  18  LAST 1477   22,3663   53'716 1           DXCH   XNB +2

 0169   REF  19  LAST 1477   22,3664   53'720 1           DXCH   XNB +4
 0170   REF  20  LAST 1477   22,3665   53'730 0           DXCH   XNB +12D
 0171   REF  21  LAST 1477   22,3666   53'720 1           DXCH   XNB +4

 0172   REF  22  LAST 1477   22,3667   53'726 1           DXCH   XNB +10D
 0173   REF  23  LAST 1477   22,3670   53'732 1           DXCH   XNB +14D
 0174   REF  24  LAST 1477   22,3671   53'726 1           DXCH   XNB +10D
 0175   REF  71  LAST 1476   22,3672   1 6030 0           TCF    DANZIG

 0176   REF   6  LAST 1477   E5,1554                     EBANK= XNB1

 0177   REF   1              22,3673   3 3656 1  TRANSP2  CAF    XNB1EB
 0178   REF  69  LAST 1477   22,3674   54 003 0           TS     EBANK
 0180   REF   7  LAST 1477   22,3675   53'557 0           DXCH   XNB1 +2
 0181   REF   8  LAST 1477   22,3676   53'563 1           DXCH   XNB1 +6
 0182   REF   9  LAST 1477   22,3677   53'557 0           DXCH   XNB1 +2

 0183   REF  10  LAST 1477   22,3700   53'561 0           DXCH   XNB1 +4
 0184   REF  11  LAST 1477   22,3701   53'571 1           DXCH   XNB1 +12D
 0185   REF  12  LAST 1477   22,3702   53'561 0           DXCH   XNB1 +4

 0186   REF  13  LAST 1477   22,3703   53'567 0           DXCH   XNB1 +10D
 0187   REF  14  LAST 1477   22,3704   53'573 0           DXCH   XNB1 +14D
 0188   REF  15  LAST 1477   22,3705   53'567 0           DXCH   XNB1 +10D
 0191   REF  72  LAST 1477   22,3706   1 6030 0           TCF    DANZIG
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R0192            THE SUBROUTINE  SIGNMPAC  SETS C(MPAC, MPAC +1) TO SIGN(MPAC).
R0193   FOR THIS, ONLY THE CONTENTS OF MPAC ARE EXAMINED.    ALSO +0 YIELDS POSMAX AND -0 YIELDS NEGMAX.

R0195   ENTRY MAY BE BY EITHER OF THE FOLLOWING:

R0196   1.       LIMIT THE SIZE OF MPAC ON INTERPRETIVE OVERFLOW:
R0197   ENTRY:          BOVB
R0198                          SIGNMPAC

R0199   2.       GENERATE IN MPAC THE SIGNUM FUNCTION OF MPAC:
R0200   ENTRY:          RTB
R0201                          SIGNMPAC

R0202   IN EITHER CASE, RETURN IS TO  THE NEXT INTERPRETIVE INSTRUCTION IN THE CALLING SEQUENCE.

 0204                          22,3707  0 0006 1  SIGNMPAC EXTEND
 0205   REF   2  LAST  351    22,3710  3 4672 0           DCA    DPOSMAX
 0206   REF 770  LAST 1475    22,3711  52 155 1           DXCH   MPAC
 0207   REF 434  LAST 1475    22,3712  10 000 0           CCS    A
 0208   REF 293  LAST 1473    22,3713  3 4714 1  DPMODE   CAF    ZERO          SETS MPAC +2 TO ZERO IN THE PROCESS
 0209   REF   4  LAST 1473    22,3714  1 6026 1           TCF    SLOAD2 +2
 0210                          22,3715  1 3716 0           TCF    +1
 0211                          22,3716  0 0006 1           EXTEND
 0212   REF   3  LAST 1478    22,3717  4 4672 1           DCS    DPOSMAX
 0213   REF   5  LAST 1478    22,3720  1 6024 0           TCF    SLOAD2

R0214        RTB OP CODE NORMUNIT IS LIKE INTERPRETIVE INSTRUCTION UNIT, EXCEPT THAT IT CAN BE DEPENDED ON NOT TO BLOW
R0216   UP WHEN THE VECTOR BEING UNITIZED IS VERY SMALL -- IT WILL BLOW UP WHEN ALL COMPONENTS ARE ZERO.  IF NORMUNIT
R0218   IS USED AND THE UPPER ORDER HALVES OF ALL COMPONENTS ARE ZERO, THE MAGNITUDE RETURNED IN 36D WILL BE TOO LARGE
R0220   BY A FACTOR OF 2(13) AND THE SQUARED MAGNITUDE RETURNED AT 34D WILL BE TOO BIG BY A FACTOR OF 2(26).

 0222   REF 184  LAST 1475    22,3721  3 4712 1  NORMUNX1 CAF    ONE
 02221  REF   1               22,3722  1 3724 1           TCF    NORMUNIT +1
 02222  REF 294  LAST 1478    22,3723  3 4714 1  NORMUNIT CAF    ZERO
 02223  REF  42  LAST 1476    22,3724  6 0120 1           AD     FIXLOC
 02224  REF 771  LAST 1478    22,3725  54 156 1           TS     MPAC  +2
 02225  REF 253  LAST 1476    22,3726  0 4555 0           TC     BANKCALL      GET SIGN AGREEMENT IN ALL COMPONENTS
 0223   REF   3  LAST 1142    22,3727   01010 1           CADR   VECAGREE
 0224   REF 772  LAST 1478    22,3730  10 154 0           CCS    MPAC
 0225   REF   1               22,3731  1 3765 1           TCF    NOSHIFT
 0226                          22,3732  1 3734 0           TCF    +2
 0227   REF   2  LAST 1478    22,3733  1 3765 1           TCF    NOSHIFT
 0228   REF 773  LAST 1478    22,3734  10 157 0           CCS    MPAC  +3
 0229   REF   3  LAST 1478    22,3735  1 3765 1           TCF    NOSHIFT
 0230                          22,3736  1 3740 0           TCF    +2
 0231   REF   4  LAST 1478    22,3737  1 3765 1           TCF    NOSHIFT
 0232   REF 774  LAST 1478    22,3740  10 161 0           CCS    MPAC  +5
 0233   REF   5  LAST 1478    22,3741  1 3765 1           TCF    NOSHIFT
 0234                          22,3742  1 3744 1           TCF    +2
 0235   REF   6  LAST 1478    22,3743  1 3765 1           TCF    NOSHIFT
```

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0236   REF 775  LAST 1478   22,3744  3 0155 C          CA     MPAC  +1      SHIFT ALL COMPONENTS LEFT 13
0237                        22,3745  0 0006 1          EXTEND
0238   REF  85  LAST 1445   22,3746  7 4675 C          MP     BIT14
0239   REF 776  LAST 1479   22,3747  20 155 1          DAS    MPAC          DAS GAINS A LITTLE ACCURACY
0240   REF 777  LAST 1479   22,3750  3 0160 C          CA     MPAC  +4
0241                        22,3751  0 0006 1          EXTEND
02411  REF  86  LAST 1479   22,3752  7 4675 C          MP     BIT14
02412  REF 778  LAST 1479   22,3753  20 160 1          DAS    MPAC  +3
02413  REF 779  LAST 1479   22,3754  3 0162 1          CA     MPAC  +6
02414                       22,3755  0 0006 1          EXTEND
02415  REF  87  LAST 1479   22,3756  7 4675 C          MP     BIT14
02416  REF 780  LAST 1479   22,3757  20 162 C          DAS    MPAC  +5
02417  REF   5  LAST 1142   22,3760  3 4720 C          CAF    THIRTEEN
02418  REF 781  LAST 1479   22,3761  50 156 C          INDEX  MPAC  +2
02419                       22,3762  54 045 1          TS     37D
0242   REF  67  LAST 1464   22,3763  0 4574 C  OFFTUNIT TC     POSTJUMP
0243   REF   2  LAST 1085   22,3764   01024 C          CADR   UNIT  +1      SKIP THE "TC VECAGREE" DONE AT UNIT


02431  REF 255  LAST 1478   22,3765  3 4714 1  NOSHIFT  CAF    ZERO
02432  REF   1              22,3766  1 3761 C          TCF    OFFTUNIT -2


R0300    RTB  VECSGNAG   ...FORCES SIGN AGREEMENT OF VECTOR IN MPAC.
0301   REF 254  LAST 1478   22,3767  0 4555 C  VECSGNAG TC     BANKCALL
0302   REF   4  LAST 1478   22,3770   01010 1           CADR   VECAGREE
0303   REF  73  LAST 1477   22,3771  0 6030 1          TC     DANZIG


*** END OF SATRAP  .004 ***
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SYMBOL TABLE LISTING, INCLUDING DEFINITION, HEALTH, PAGE OF DEF, # OF REFS, PAGE OF FIRST REF, PAGE OF LAST REF.

SYMBOL	DEF	H	REFERENCES	SYMBOL	DEF	H	REFERENCES	SYMBOL	DEF	H	REFERENCES
.05G	26,3237		831 1 801	-OCT10	6171		1080 1 1080	==========			
.05GBIT	4710	=	56	-ON	40,2334		313 2 312 351	A	0000	=	36 434 79 1478
.05GSW	0146	=	56 4 801 820	-PHASE1	0752		72 6 180 1376	A-PCHK	13,3136		1286 4 1283 1296
.166...	23,3430		1327 1 1323	-PHASE2	0754		72 3 180 196	ABCLOAD	41,2612		335 1 319
.3D	11,3674		1317 1 1288	-PHASE3	0756		72 3 180 524	ABLOAD	41,2677		336 1 319
.5SEC	4731		1168 8 126 1410	-PHASE4	0760		72 3 180 649	ABORT	5604	=	1460
.6SECTS	24,2776		652	-PHASE5	0762		72 5 180 776	ABORT2	5624		1459 1 1459
==========				-PHASE6	0764		72 4 180 1470	ABS	00,3226		1148 2 1147
+DECSGN	40,2204		311 1 311	-ROLL1	4377	=	957 1 955	ABVAL	00,3201		1147
+DOWN	00,2610		1135 1 1134	-ROLL2	16,3733		957 1 955	ABVALABS	00,3176		1147 1 1085
+LIMIT	42,3252		332 1 332	-SLOPE	16,3723		957 3 950 952	ACADN83	24,2404		643 1 644
+MGA	E7,1625	=	119 9 119 627	-T-3	15,3752		1059 1 1054	ACADN85	24,2410		643 2 639 641
+ON	40,2314		312 3 312 351	-TORQLE	16,3666		955 1 954	ACBD2Y	17,3437		1024 1 1024
+ROLL1	4715	=	957 1 955	-TPER	E4,1745	=	88 7 88 512	ACBD2Z	17,3502		1025 1 1024
+ROLL2	4732	=	957 1 955	-UP	00,2620		1135 1 1134	ACCEPTUP	07,3626		1413 2 1414
+TORQUE	16,3645		954 1 954	-VM/360K	15,3760		1059 1 1051	ACCEPTWD	41,2027		316 2 316
+2ACTDEG	20,2144		684 2 683	-VREL	E7,1525	=	115 3 115 833	ACCOMP	11,2430		1301 1 1309
==========				-VT/180	E6,1613	=	109 13 109 1052	ACCWD	E5,1522	=	96 2 431
NBSM	23,3601		1333 1 495	-VT/180E	E6,1570	=	110 1 1050	ACORBD	E6,1630	=	106 5 106 1025
SMNB	23,3577		1333 5 279 884	-1/KB2	26,3211		831 1 817	ACOS=0	00,3636		1156 3 1156 1158
==========				-1/12	13,3754		1318 1 1307	ACOSABRT	00,3722		1158
-AYD	E3,1713	=	83 2 616 1217	-1/2+2	00,2444		1131 1 1152	ACOSOVF	00,3720		1158 1 1156
-BIT10	06,2763		154 1 150	-1/8	7710		1170 1 1066	ACOSSHR	00,3713		1158 1 1156
-BIT14	7705		1170 2 685 901	-1CHK	43,3270		1361 5 1362 1367	ACOSST	00,3624		1156 1 1156
-CGSPR	01,3153		1185 1 1186	-15DEGS	06,2506		143 1 142	ACOSST2	00,3641		1156 2 1156
-CDUT+1	20,3673		1037 1 1036	-2SEC	10,3677		1458 1 1444	ACOSZERO	00,3724		1158 1 1156
-COMMAX	07,3544		1406 2 1388 1389	-4ACTDEG	20,2143		684 1 683	ACOS3	00,3651		1157 1 1158
-COMMAX-	07,3545		1406 2 1388 1389	-5DSC	04,3512		1255 1 1243	ACRBDZ	17,3057		1012 2 1012
-COSB	E5,1673	=	92 1 92	-6.05DEG	26,3011		761 1 760	ACRJETS	17,3176		1016 2 1011 1024
-DELAIG	E6,1676	=	108 5 108 1039	-7DEGS	06,2505		143 1 142	ACROLL	17,3007		1011
-DELAMG	E6,1677	=	108 4 108 1039	==========				ACTCENT	E5,1632	=	90 3 90 465
-DELAOG	E6,1675	=	108 3 108 1039	/BUF+	00,2721		1139 2 1138	ACTIVE	22,3376		488 2 462 488
-ELR	05,3155		188 2 184	/BUF-	00,2715		1138 2 1138	ACTLIM	20,3145		934 2 923 928
-ENDERAS	7712		1170 1 1077	/MPAC+	00,2767		1140 2 1140	ACTSAT	20,3377		938 2 934
-ENDVAC	6220		1081 2 1077 1095	/MPAC-	00,2763		1140 2 1140	ACYCHECK	17,3115		1013
-ERTHRAT	34,2277		529 1 526	/NORM	00,2732		1139 1 1139	ACYJETS	17,3212		1017 2 1013 1024
-FOURDT	17,2002		674 1 673	/NORM2	00,2725		1139 1 1139	ACZY	17,3455		1024 2 1024
-GYROMIN	07,3322		1398 2 1398 1401	==========				ADB	E6,1655	=	107 7 107 999
-HSCALED	26,3313		832 1 802	=.24	21,2610		983 1 982	ADBVEL	E6,1523	=	105 4 998 1001
-KSCALE	26,3315		832 1 802	=+.1SEC	17,3337		1021 5 1018 1025	ADDINDRF	33,3262		435 1 435
-KVSCALE	37,3673		839 1 833	=+14MS	21,3034		987 1 984	ADDRESS	6052		1076
-MAXADRS	4364	=	1360 1 1365	=-.1SEC	17,3335		1021 3 1018 1021	ADDRWD	0116		66 79 1074 1334
-MAXDELV	37,3141		781 1 779	=-2	7715	=	1017 4 1012 1025	ADENDEXT	25,3024		814 1 812
-MUDT(E)	37,3357		787 1 787	=-4	6061	=	1017 2 1012 1013	ADERCOMP	33,3347		437
-MUDT(M)	37,3361		787	=14MS	17,3342		1021 7 1007 1021	ADIAX	E3,1463		82 1 292

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

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BD BADLY DEFINED CD DEFINITION ASSOCIATED WITH CONFLICT XX MISCELLANEOUS TROUBLE

SYMBOL TABLE LISTING, INCLUDING DEFINITION, HEALTH, PAGE OF DEF, # OF REFS, PAGE OF FIRST REF, PAGE OF LAST REF.

SYMBOL	DEF	H	REFERENCES	SYMBOL	DEF	H	REFERENCES	SYMBOL	DEF	H	REFERENCES
ADIAY	E3,1464	82	1 292	ALARUPS	35,3534	549	2 544 545	ALXXXZ	33,3132	433	1 425
ADIAZ	E3,1465	82	1 293	ALCGKK	33,2672	430		ALX1S	E5,1454	= 96	4 425 433
ADOT	E6,1533	= 105	9 105 998	ALDK	E5,1542	= 96	3 430 431	AM	E6,1764	= 111	4 111 403
ADOTLOOP	21,2275	974	1 974	ALFA/PIP	E6,1673	= 108	2 108 838	AMBGLPDT	22,3444	1005	2 974 983
ADOT1	E6,1535	= 105	1 105	ALFA/180	E6,1665	= 108	9 108 1041	AMG	E6,1663	= 108	6 108 1039
ADOT2	E6,1537	= 105	1 105	ALFACOM	E6,1603	= 109	4 109 1042	AMG/PIP	E6,1671	= 108	2 108 775
ADRPCHN2	5313	1374	1 1374	ALFAPAD	E6,1411	98	2 744 769	AMGB1	E6,1640	= 106	5 106 1005
ADRS+1	43,3622	1366		ALFDK	E4,1422	= 89	1 430	AMGB4	E6,1641	= 106	5 107 1005
ADRSCHK	43,3571	1365	2 1365	ALFLT	33,2634	429	1 428	AMGB5	E6,1642	= 107	5 107 1005
ADRS1	43,3241	1360	1 256	ALFLT1	33,2640	429	1 211	AMGB7	E6,1643	= 107	5 107 1006
ADSRAX	E3,1466	82	1 292	ALFLT3	33,2707	430	1 430	AMGB8	E6,1644	= 107	5 107 1005
ADSRAY	E3,1467	82	1 292	ALILP	33,2732	430	1 430	AMOVED	11,3532	1314	1 1313
ADSRAZ	E3,1470	82	1 292	ALINTIME	43,2332	239	1 229	ANGLTIME	22,3001	403	1 403
ADSUM	43,3560	1365	2 1365	ALK	E5,1456	= 96	9 96 436	ANGOVCOR	15,2542	1033	4 1041 1042
ADTIME	35,2464	462	1 462	ALKCG	33,2675	430		ANGX	E5,1510	= 96	2 431 432
ADUPBFM1	27,3616	1469	2 1465 1466	ALKCG2	33,2700	430	1 430	ANGY	E5,1506	= 96	1 432
ADUPBUFF	27,3451	1466	1 1465	ALKLP	33,2741	430	1 431	ANGZ	E5,1502	= 96	1 432
ADUPTEMP	27,3450	1466	1 1466	ALLOC/CC	41,3004	337	2 335 336	ANNNNNN	33,3377	437	1 426
ADVAN	01,3231	1187	2 1182 1361	ALLOOP	33,2575	428	1 427	AOG	E6,1661	= 108	40 108 1055
ADVCSM	36,2242	543	1 542	ALLOOP1	33,2603	428	1 210	AOG/PIP	E6,1667	= 108	3 108 834
ADVORB	14,2206	699	1 554	ALLOOP3	33,2577	428		AOPTIME	E4,1755	= 88	13 88 730
ADVTKBIT	4701	= 59		ALLSET	35,2727	469	1 469	AOTSTALL	07,3512	1404	1 1405
ADVTRACK	26,2000	729	1 727	ALLSTALL	13,3373	1289	2 1291	APOPERI	22,2000	= 28	1 486
ADVTRK	0175	= 59	3 696 727	ALL3DEC	42,3506	346	1 344	APSESBIT	4706	= 59	
AD14MSP	17,3243	1018	1 1018	ALM/END	43,2124	231	18 230 260	APSESW	0202	= 59	2 1268 1269
AD14MSR	17,3363	1021	1 1021	ALMCADR	1363	= 79	11 79 1460	APSIDES	12,3671	1269	1 486
AD14MSY	17,3307	1020	1 1020	ALMCYCLE	4161	356	16 317 357	APO	E6,1427	98	2 98 961
AEARTH	31,3031	619	1 616	ALOAD	41,2726	336	1 319	APO(EP)	17,2222	961	
AERR	E6,1517	= 105	6 105 1001	ALOADED	13,3127	1286	2 1285 1286	AP1	E6,1430	98	3 98 962
AERRVEL	E6,1522	= 105	8 105 1000	ALP	E7,1703	= 116	7 116 816	AP1(EP)	17,2275	962	
AFAILP	17,2703	1008	1 1008	ALPHA	0010	= 1271	4 1243 1245	AP2	E6,1432	98	3 98 962
AGAIN	30,3663	665	3 630 665	ALPHAM	E4,1707	= 87	13 87 1306	AP2(EP)	17,2335	962	
AGAINMM	04,2076	193	1 194	ALPHAV	E4,1551	= 86	47 86 1316	AP3	E6,1434	98	3 98 963
AHEAD5	6402	1088	1 1088	ALRM15	4720	= 694	1 693	AP3(EP)	17,2372	963	
AHFNOROT	21,3234	993	1 985	ALSIGNAG	7513	1115	4 1138 1141	ARATE	22,2771	403	3 403
AHOOKDV	E7,1657	= 115	4 116 816	ALSK	33,3701	444	1 431	ARCCOS	00,3611	1156	1 1085
AIG	E6,1662	= 108	3 108 1031	ALT	1107	= 75	8 75 1206	ARCSIN	00,3607	1156	1 1085
AIG/PIP	E6,1670	= 108	1 108	ALTCALC	22,2123	391	1 391	ARCTAN	13,2463	1207	2 1204
AINGOTN	33,2214	417	1 417	ALTI	E7,1734	= 117	3 117 534	ARCTANXX	13,2511	1207	2 1207
AINLA	E5,1444	= 96	49 96 97	ALTIM	E5,1540	= 96	4 427 428	ARCTRIG	23,3211	1321	10 280 1324
AK	E6,1476	99	17 110 990	ALTIMS	E5,1541	= 96	2 428 430	ARG+	7234	1108	1 1108
AK1	E6,1477	99	8 534 1042	ALTM	0060	= 37		ARGHI	00,3416	1152	2 1153
AK2	E6,1500	99	9 534 1045	ALTTAB	31,3704	894	2 555 620	ARGLO	00,3467	1153	1 1153
ALARM	5537	1457	39 137 1393	ALTVAR	1356	80	1 572	ARGZERO	7254	1108	1 1108
ALARM2	5541	1457	2 1360 1459	ALWAYSG	33,3204	434	2 429 435	ARGZERO2	7251	1108	1 1108

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ARG90	5C24		1174 1 1174	ATTHOLD	21,3306		995 3 993 996	AZO	E3,1711		83 1 1216
AROUTISF	40,2610		329 1 327	ATTKALMN	E6,1617	=	106 10 106 1008	AO	0327	=	69 8 806 819
ARTHINSF	40,2764		342 1 341	ATTPRIC	1327	=	78 2 409 1406	AOCALC	25,2400		806 1 806
ARTINISF	40,2777		342 1 341	ATTRATES	15,2705		1041 1 1040	A1	E7,1663	=	116 4 116 816
ARTOUTSF	40,2603		329 1 327	ATTSEC	E6,1560	=	106 3 106 974	==========			
ARUPT	0010	=	36 11 126 1199	AUGEKUGL	32,2071		633 2 632 853	BACK	25,3346		821 1 821
ASCALE	13,3724		1317 1 1303	AUG2	07,3401		1400 1 1399	BACKWARD	12,2272		1247 1 1244
ASET	34,3256		581 3 581 584	AUG3	07,3352		1399 1 1400	BACK2	25,3371		822 1 822
ASINEX	CC,3706		1157 1 1156	AUTOCK	34,3243		581 1 582	BADBKWDX	12,2305		1247 2 1247
ASKEP	E7,1730	=	116 2 810 811	AUTOCCNT	21,3252		993	BADEND	07,3464		1403 2 576 1402
ASKIFNRM	10,2656		1433 1 1433	AVECTR	0024	=	1218 7 1213 1215	BADR2	12,3661		1269 2 1268
ASMBLWF	17,3406		1023 2 1018 1019	AVEGBIT	4712	=	46	BADVCTOR	24,3661		669 1 669
ASMBLWR	17,3426		1024 2 1021	AVEGEXIT	1222	=	76 10 76 755	BADX	12,2265		1247 3 1244
ASMBLWY	17,3552		1026 2 1020	AVEGFLAG	0035	=	46 2 504 755	BAILOUT	5604		1459 8 216 1460
ASPDWN	E7,1733	=	116 1 811	AVEGOUT	37,2765		777 1 776	BANDTABL	31,3526		891 1 887
ASPS	E7,1730	=	116 6 116	AVEMDBIT	4712	=	62	BANKCALL	4555		1070 254 189 1479
ASPS(TM)	E6,1525	=	113 1 811	AVEMIDSW	0225	=	62 3 282 1293	BANKJUMP	4577		1070 12 318 1445
ASPUP	E7,1732	=	116 1 810	AVERAGEG	37,3052		779 1 779	BANKMASK	4364	=	1171 3 1082 1095
ASP1	E7,1731	=	116 1 810	AVETOMID	13,3472		1292 1 780	BANKRUPT	0016	=	36 26 128 1414
ASP3	E7,1734	=	116 2 811	AVFLAG	0050	=	48 10 483 665	BANKSET	0165		69 14 1072 1447
ASTNBIT	4677	=	57	AVFLAGA	35,3726		636 5 453 547	BARELV1	27,3333	=	830 4 807 816
ASTNFLAG	0154	=	57	AVFLAGP	35,3741		636 5 453 547	BASECTP	E4,1624	=	86 2 497 498
ASTNV99P	24,3335		659	AVFLBIT	4706	=	48	BASECTV	E4,1640	=	86 2 497 498
ASTROMSK	10,3645		1447 1 1443	AVGEND	37,3074		780 1 777	BASETEMP	1061	=	198 2 197
ASTROTIM	04,2762		492 1 493	AVGEXIT	1222	=	76 3 527 780	BASETHP	E4,1654	=	86 2 497
ATAN=90	13,2516		1207 1 1207	AVOUTCAD	37,2771		777 1 777	BASETHV	E4,1662	=	86 2 497
ATOOTCAD	15,2703		1040 1 1040	AX*SR*T	23,3603		1333 1 1332	BASETIME	E4,1671	=	86 3 497 498
ATERJOB	34,2326		530 2 529 534	AXC	01,2376		1159 1 1084	BB	0006	=	1375 5 1374 1382
ATERSET	34,2420		534 1 530	AXISCODE	E7,1477	=	119 2 120 201	BBANK	0006	=	36 37 126 1457
ATERTASK	34,2314		529 2 209 525	AXISGEN	23,3334		1325 3 442 721	BCDU	E6,1661	=	111 16 108 1406
ATIGINC	E4,1421		85 2 458 519	AXISGEN1	23,3342		1325 1 1325	BDDV	7552		1116 2 1083 1116
ATOPCSM	13,2636		1280 4 32 1314	AXISGEN2	23,3371		1325 1 1326	BDFAIL	20,2254		686 2 686
ATOPLEM	13,2711		1282 4 32 1314	AXISGEN3	23,3414		1326 1 1326	BDF2Z	17,3533		1025 2 1025
ATOPOTH	13,2711	=	32 1 502	AXC	E3,1715	=	83 2 616 1217	BDOT	26,3643		1218 1 1213
ATOPTHIS	13,2636	=	32	AXT	01,2371		1159 1 1084	BDRACZ	17,3141		1013 2 1013
ATTACHED	43,3032		257 1 229	AYO	E6,1427	=	98 1 964	BDRJETS	17,3177		1016 2 1013 1025
ATTACHIT	43,3037		257 1 257	AYO(EY)	17,2414		964	BDROLL	17,3075		1013 2 1011
ATTCADR	1325		78 6 78 1406	AY1	E6,1430	=	98 2 965	BDSU	7031		1101 1 1083
ATTCHBIT	4711	=	58	AY1(EY)	17,2467		965	BDT	E7,1704	=	121 7 121 677
ATTCHFLG	0166	=	58	AY2	E6,1432	=	98 2 965	BDZCHECK	17,3033		1011
ATTCK1	43,2453		243 1 242	AY2(EY)	17,2527		965	BDZJETS	17,3211		1017 2 1012 1025
ATTDISP	34,2337		530 1 530	AY3	E6,1434	=	98 2 966	BECONSTD	25,3220		818 1 808
ATTDISPR	37,2124		532	AY3(EY)	17,2564		966	BEE17	04,3467		1255
ATTDISP1	37,2103		531 1 531	AZIMUTH	E5,1400		95 6 415 532	BEE19	04,3501	=	1255 1 1263
ATTDISP2	34,2366		533 1 533	AZMTHCG1	33,3737		445 2 208 241	BEE22	04,3505	=	1255 1 1245

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BELOW1	10,2400		1376 1 1377	BIT1	4712		1167 84 44 1469	BOOSTEMP	E6,1716	=	112 4 533 534
BELOW2	10,2415		1376 2 1376	BIT10	4701		1167 50 43 1414	BORTENT	5544		1457 2 1459
BELOW3	10,2431		1376 1 1376	BIT11	4700		1167 37 43 1411	BOTHJOBS	10,3013		1436 1 1436
BELOW4	10,2434		1376 2 1376	BIT12	4677		1167 35 43 1442	BOTHPAD	23,2473		506 1 506
BESTI	0302	=	69 16 69 735	BIT13	4676		1167 53 43 1441	BOTHSGN	40,2300		312 1 312
BESTJ	0303	=	69 3 69 706	BIT13-14	4371	=	1171	BOTHSHIP	23,2426		505 1 506
BESTTRIM	24,2762		651	BIT14	4675		1167 87 43 1479	BOV(B)	01,2504		1162 1 1084
BETA/PIP	E6,1674	=	108 3 108 838	BIT14+7	27,2124		383	BPL	01,2530		1163 1 1163
BETA/180	E6,1666	=	108 7 108 1044	BIT14CDM	10,2427		1376 1 1376	BPL/BMN	01,2521		1163 1 1084
BETACDM	E6,1604	=	109 2 109 1044	BIT15	4674		1167 58 43 1458	BP1	E6,1436		98 4 98 962
BETADOT	E6,1704	=	108 6 108 1046	BIT15+6	7703		1170 2 153 1435	BP1(NPO)	17,2253		961
BETAM	E4,1607	=	86 6 86 1316	BIT15/14	41,3227		347 2 347 349	BP2	E6,1440		98 4 99 962
BETAV	E4,1557	=	86 11 86 1303	BIT2	4711		1167 47 46 1469	BP2(NPO)	17,2313		962
BETA1	E7,1753	=	124 4 124 868	BIT3	4710		1167 40 44 1471	BP3	E6,1442		98 4 99 963
BETA12	E7,1764	=	124 8 117 860	BIT4	4707		1167 56 44 1441	BRANCH	6672		1097 8 1108 1163
BFAILY	17,2737		1009 1 1009	BIT5	4706		1167 49 44 1455	BRATE	E6,1710	=	111 5 403 407
BHIZ	01,2477		1162	BIT6	4705		1167 59 44 1466	BRNCHCON	40,2501		315 1 315
BIAS	E6,1564	=	106 5 106 996	BIT7	4704		1167 53 44 1456	BRNCHCTR	12,2252		1246 1 1247
BIASCALE	22,3025		404 1 403	BIT7-8	04,2374		198 1 195	BRUPT	0017	=	36 1 1459
BIASCOM	40,2532		328 2 328	BIT8	4703		1167 33 44 1464	BSUBO	26,3651		1218 1 1213
BIASED2	15,3022		1043 3 1045 1046	BIT9	4702		1167 39 43 1469	BUF	0130		66 131 66 1475
BIASHI	00,2566		1133 1 1152	BLANKCHK	10,3260		1441	BUF+	00,2422		1130 3 1129 1132
BIASLO	00,2270		1126 1 1153	BLANKCOM	40,2515		315 2 315 327	BUF-	00,2416		1129 3 1129 1132
BIASTEMP	E6,1674	=	111 4 403 407	BLANKDSP	41,3506		363 2 363	BUFBANK	34,3226		573 1 573
BIAS1	E6,1565	=	106 5 106 996	BLANKET	5415		1429 18 473 1448	BUFLIM	15,3761	=	1059 4 1050
BIAS2	E6,1566	=	106 5 106 996	BLANKRET	0114	=	66	BUFNEG	00,2531		1132 1 1129
BIGTIME	12,3441		1266 1 1265	BLANKSUB	4271		366 2 349 1441	BUFNORM	00,2500		1132 1 1132
BINCON	4377		371 3 351 1171	BLAST	E6,1457	=	99 21 99 1030	BUFPOS	00,2516		1132 2 1129 1132
BINROUND	40,2774		342 3 341 342	BLAST1	E6,1461	=	99 22 99 1030	BUFZERO	00,2363		1129 1 1132
BIS	36,2207		542 1 544	BLAST2	E6,1463	=	99 16 99 1030	BUF2	0133		66 25 68 1458
BITSOFF	41,2670		336 1 336	BLNKBANK	4316		366 1 366	BUNKER	E6,1667	=	102 9 102 944
BITSOFF1	41,2675		336 1 336	BLNKSLB1	40,3406		367 2 366	BUSYMASK	10,3655		1447
BITS15+7	10,3650		1447 1 1434	BLOAD	41,2737		337 1 319	BUTTONS	05,2555		181 1 181
BITS2-10	4746		1168	BMAGX	0042	=	36	BVECTOR	E7,1501	=	118 22 118 1220
BITS3&4	5660	=	1406 2 1385 1386	BMAGY	0043	=	36	BVECTORS	23,3047		564 2 569 594
BITS4+10	10,3653		1447 1 1446	BMAGZ	0044	=	36	BVECTR	0032	=	1218 5 1214
BITS4&5	4722		1168 3 138 160	BNKCHK	43,3713		1367	BVSU	7005		1100 1 1083
BITS4&6	4726	=	1406 2 1385	BNKOPTN	43,3312		1361	BYPASS	27,2520		576 1 576
BITS4-5	07,3543		1406 1 1391	BODYATT	37,2000	=	31 1 833	BY1	E6,1436	=	98 3 964 965
BITS4,5	21,2173		972	BODYRATE	15,2556		1038 1 1032	BY1(NYO)	17,2445		964
BITS5+11	10,3652		1447 3 1439 1446	BODY1	E6,1706	=	112 1 112	BY2	E6,1440	=	99 3 965
BITS5-6	4730	=	524	BODY2	E6,1705	=	112 1 112	BY2(NYO)	17,2505		965
BITS6,8	40,3566		380	BODY3	E6,1704	=	112 8 112 538	BY3	E6,1442	=	99 3 966
BITS7+4	10,3651		1447 2 1433	BOKKEP2	05,3267		911 1 911	BZE/GOTO	01,2514		1163 1 1084
BITS7&8	06,2757		154 2 137 149	BOOP	33,3020		431 1 432	BZERO	E6,1742	=	103 10 896 957

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BZSTORE	20,2466		923	CALCGTA	23,3140		1319 3 442 711	CD*TR*GS	23,3450		1330 3 1329 1333
B1	E6,1545	=	100 3 100 925	CALCLEM	34,3475		584	CDELF/2	0016	=	1337 3 632 766
B1TMP	E6,1717	=	103 5 103 934	CALCMAN2	0053	=	48 2 403 405	CDRVE	06,2012		129
B12-1	4372	=	371	CALCMAN3	0052	=	48 1 403	CDSEC	36,2004		539 1 544
B12T14	7671	=	1171 1 1086	CALCN83	24,2440		644 1 643	CDU*NBSM	23,3567		1332
B2	E6,1546	=	100 1 101	CALCN85	24,2325		642 1 643	CDU*SMNB	23,3554		1332
B2/A2	13,2455		1206 1 1208	CALCPFI	22,2702		401 1 401	CDUANG	E5,1553	=	96
B2TMP	E6,1720	=	103 4 103 934	CALCRVG	37,3325		787 1 780	CDUCHKWD	1341		79 2 226 227
B2XSC	13,2453		1206 1 1206	CALCSMSC	16,2567		715 2 704 725	CDUFLAG	E5,1471	=	95
B3	E6,1547	=	101 3 101 925	CALCSXA	23,2034		279 1 728	CDUINC	22,3623		1475 3 1475
B3TMP	E6,1721	=	103 4 103 934	CALCTFF	27,3031		1346 4 512 761	CDUIND	E3,1474	=	82 23 137 1399
B3TOB4	01,2623		1166 2 1165 1166	CALCTLS	31,3230		886 1 886	CDULIMIT	E5,1453	=	95
B4	E6,1550	=	101 1 101	CALCTPER	27,3026		1346 1 512	CDULOGIC	22,3510		1472 10 278 1330
B4TMP	E6,1722	=	103 4 103 934	CALCUT	30,3716		666 1 665	CDULOOP	34,3272		581 1 581
B5	E6,1551	=	101 3 101 925	CALC2BIT	4711	=	48	CDUNDX	E5,1546	=	96
B5OFF	5514		1455 8 494 885	CALC3BIT	4710	=	48	CDUREADF	E5,1451	=	95
B5TMP	E6,1723	=	103 4 103 934	CALFA	E6,1506	=	109 9 109 1057	CDUREADI	E5,1452	=	95
B5TOB8	01,2512		1162	CALL	6607		1095 1 1163	CDUS	0036	=	36 8 36 498
B6	E6,1552	=	101 1 101	CALL/ITA	01,2534		1163 1 1084	CDUSCMD	0054	=	37 2 37
B6TMP	E6,1724	=	103 4 103 935	CALLCODE	4723		1168 1 1087	CDUSPOT	0766		72 14 72 1332
B7TMP	E6,1725	=	103 3 103 935	CALLCON	26,2656		759 1 761	CDUSPOTX	0772	=	72 1 658
==========				CALLRECT	11,3234		1309 4 1308	CDUSPOTY	0766	=	72 1 658
C(30)LIM	26,2643		756 2 755 756	CALLRPRT	13,2425		1205 1 1205	CDUSPOTZ	0770	=	72 1 658
C*MM*N1	23,3561		1332 2 1332 1333	CALLRTRP	13,2335		1203 1 1203	CDUT	0035	=	36 8 36 696
C*MM*N2	23,3563		1332 1 1333	CALLR35	43,3004		256 1 230	CDUTCMD	0053	=	37 3 37 163
C*MM*N3	23,3574		1333 2 1333	CALLR52	30,2114		554 1 554	CDUTIMEF	E5,1446	=	95
C/DO	E7,1705	=	116 3 116 818	CALL4C.8	24,3047		653 2 652 654	CDUTIMEI	E5,1444	=	95
CA+ECE	07,2742		1389 2 143 182	CALOOP	14,2775		713 1 714	CDUTODCM	22,2405		396 3 385 390
CADDY	E6,1665	=	102 7 102 944	CALOOP1	14,3034		714 2 713	CDUTRIG	23,3432		1329 9 495 884
CADRFLSH	0372		71 7 167 1445	CALSAM1	15,2437		735 1 734	CDUTRIGS	23,3442		1329 3 1329 1332
CADRMARK	0373		71	CAL53A	14,2763		713 1 693	CDUX	0032	=	36 31 167 1388
CADRMASK	10,3656		1447 1 1438	CAM	E6,1716	=	111 5 111 392	CDUXCMD	0050	=	36 4 147 1388
CADRSTOR	1042		73 13 187 1443	CANCOARS	06,3140		158 2 157	CDUXD	E6,1646	=	107 10 107 976
CADRTAB	01,2001	=	205 1 1381	CANDEL	23,2645		509 1 506	CDUY	0033	=	36 17 218 1384
CAGESUB	06,2717		153 1 137	CANTOC	32,2063		633 2 632	CDUYCMD	0051	=	36 2 147 979
CAGESUB1	06,2725		153 1 147	CANTRCC	04,2070		193 1 192	CDUYD	E6,1650	=	107 5 107 583
CAGESUB2	06,2730		153 1 139	CANV37	04,2123		194 2 194 781	CDUZ	0034	=	36 23 142 1384
CAGETEST	07,3443		1402 5 1387 1399	CANZOPT	06,3070		156 2 156	CDUZCMD	0052	=	37 2 147 979
CAGETSTJ	07,3455		1402 7 1385 1394	CAPSI	E6,1645	=	107 4 107 1005	CDUZD	E6,1652	=	107 5 107 583
CAGETSTQ	07,3450		1402 3 1392 1393	CARD	E6,1671	=	102 6 102 944	CEARTH	0016	=	702 3 701 707
CALCDIR	E5,1470	=	95	CATLOG	14,3750		1357 10 620 735	CENTANG	E7,1753	=	123 6 166 547
CALCDT6	17,3607		1027 2 1028	CCALL	6575		1095 1 1083	CFAILP	17,2705		1008 1 1008
CALCGA	23,3244		1323 3 415 769	CCSHOLE	5642		1459 18 311 1186	CFPA	E7,1756	=	124 4 124 871
CALCGA1	23,3304		1323 1 1324	CCSL	7632		1118 1 1171	CG.CORR	16,3064		904
CALCGRAV	37,3260		786 4 526 787	CD*TR*G	23,3436		1329	CGOTO	6652		1096 1 1083

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CHAN	E5,1453	= 95		CHKSDA	14,2757	713	1 713	CM/DSTBY	0147	= 56	1 780
CHANDSP	41,2503	326	1 325	CHKSDATA	14,2707	712	2 711 721	CM/DUMPR	15,3715	1057	
CHANG1	5C57	1175	4 419 1366	CHKSTRK	16,3247	916	1 916	CM/END	15,3742	1058	1 1057
CHANG2	5C63	1175	1 1075	CHKSUPR	43,3643	1366	1 1366	CM/FDAI	15,3677	1057	2 1042
CHANJOB	01,2727	1180	4 1175 1186	CHKTEMX	37,3244	785	1 784	CM/FDAIR	15,3711	1057	2 1056 1057
CHANLOAD	41,3154	340	1 340	CHOOK	26,3247	831	1 808	CM/FLAGS	0102	= 795	23 751 1056
CHANTEMP	E6,1633	= 106	4 106 993	CHRPRIO	4371	371	7 131 1467	CM/GYMDT	E6,1725	= 109	6 109 1036
CHAN12	0012	=√ 38	47 138 1399	CH1	26,3253	832	3 808 816	CM/GYMIC	15,2532	1032	2 1031 1032
CHAN13	0013	=√ 38	15 178 1411	CH31TEMP	E6,1632	= 106	5 106 985	CM/POSE	37,3375	833	1 747
CHAN14	0014	=√ 38	19 147 1401	CKLFTBTS	43,2463	243	2 242	CM/POSE2	37,3424	833	1 833
CHAN30	0030	=√ 38	5 134 437	CKMDNCRE	43,3746	1464	1 1463	CM/POSE3	37,3660	838	
CHAN31	0031	=√ 38	12 382 1007	CKMIO2	13,3650	1295	1 1313	CM/RCS	15,3231	1048	1 1042
CHAN32	0032	=√ 38	2 131 993	CKMODCAD	43,2275	236	4 232 236	CM/SAVE	E6,1623	= 110	3 110 1058
CHAN33	0033	=√ 38	5 140 576	CKNVWRD1	24,3256	658	1 657	CM/SWIC1	20,3672	1037	1 1036
CHAN5	0005	=√ 971	8 178 1098	CKOPTVB	43,2373	240	1 229	CM/SWIC2	4377	= 1037	1 1036
CHAN6	0006	=√ 971	8 178 1030	CK1K2	32,2202	635	1 634	CM/TRIO	37,3434	834	
CHAR	0117	= 66	5 308 310	CK4V32	27,3442	1466	3 1465 1466	CMARMBIT	4677	= 54	
CHARALRM	40,3335	356	16 308 356	CLEANDSP	10,2607	1432	8 443 746	CMCSTADL	05,2113	= 168	2 165 175
CHARIN	40,2000	308	1 1413	CLEANEND	10,3361	1442	1 1440	CMCSTA01	05,2047	= 168	1 168
CHARIN2	40,2013	308	2 308	CLEANOUT	43,2677	253	1 259	CMCSTA02	05,2056	= 168	2 168
CHAZFOGC	43,2404	240	1 230	CLEAR	40,2370	314	1 309	CMCSTA03	05,2063	= 168	2 168
CHECKB	5363	1377	1 1374	CLEARMRK	5425	1429	6 198 1429	CMCSTA04	05,2065	= 168	1 168
CHECKCTR	12,2651	1253	2 1246 1265	CLEARW5	30,2343	588	1 589	CMCSTA05	05,2067	= 168	1 168
CHECKG	33,2321	419	2 416 417	CLEARW54	30,3451	600	1 600	CMCSTA06	05,2076	= 168	1 168
CHECKG1	33,2324	419	1 419	CLEAR1	40,2423	314	1 314	CMCSTA07	05,2101	= 168	1 168
CHECKMAX	22,2111	391	1 391	CLOAD	41,2754	337	1 319	CMDAPARM	0135	= 54	
CHECKMM	5253	1368	12 216 724	CLOCKJOB	24,3246	658	1 656	CMDAPMOD	E6,1700	= 108	11 108 1057
CHECKNJ	43,3327	1361	3 1361 1366	CLOCKON	24,3203	656	1 656	CMDSETUP	10,2122	163	5 162 163
CHECKTAB	04,2075	193	1 193	CLOG2/32	23,2213	285	1 284	CMDSOUT	16,3226	915	1 917
CHECKT23	17,3603	1027	1 1028	CLOKTASK	24,3174	656	5 211 656	CMDTMP	E6,1744	= 103	29 103 934
CHEKAVEG	37,2742	776	2 211 775	CLPASHI	40,2406	314	1 314	CMENTRDL	05,2214	= 172	2 165 175
CHEKAXIS	27,2225	386	1 386	CLPASS	1015	73	13 187 364	CMENTR01	05,2047	= 172	1 172
CHKCOMED	33,3402	437	3 427 435	CLRMOCN	13,2666	1281	2 1282 1310	CMENTR02	05,2056	= 173	2 172
CHKCORS	07,2675	1388	1 1389	CLROVFLW	13,2465	1207	1 1207	CMENTR03	05,2063	= 173	1 172
CHKCTR	37,3006	778		CLRW678	30,3076	595	1 595	CMENTR04	05,2065	= 173	1 172
CHKFAIL1	5553	1457		CLR5	40,2426	314	1 314	CMENTR05	05,2264	173	1 172
CHKFAIL2	5557	1457	1 1457	CLSEC	36,2006	539	1 545	CMENTR07	05,2101	= 173	
CHKLINUS	27,2056	382	2 381 382	CLUPDATE	35,3063	472	1 471	CMNTOVFL	12,2316	1247	1 1247
CHKLIST	05,3355	1064		CLUPLOCK	07,3700	1414	1 1414	CMOON	0022	= 702	2 701 702
CHKNOVAC	01,3631	1380	1 1383	CM/ATLP	37,3562	837		CMOONBIT	4677	= 58	
CHKPOOH	43,2717	254	7 240 256	CM/BIAS	15,3211	1046	2 1043	CMOONFLG	0173	= 58	23 32 1281
CHKPRIO	10,2560	1431	1 1430	CM/DAPIC	20,3630	1036	1 743	CMPG22DL	05,2273	= 174	1 175
CHKSAB	14,2712	712		CM/DAPCN	20,3550	1034	1 744	CMPG2201	05,2047	= 174	1 174
CHKSB	14,2714	712	1 712	CM/DAP2C	20,3633	1036		CMPG2202	05,2056	= 174	2 174
CHKSD	14,2733	712	1 712	CM/DSBIT	4711	= 56		CMPG2203	05,2063	= 174	2 174

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SYMBOL	DEF	H	REFERENCES	SYMBOL	DEF	H	REFERENCES	SYMBOL	DEF	H	REFERENCES
CMPG2204	05,2065	= 175	1 174	COEFPOLY	34,2510	535	1 531	CONC+S2	43,3237	1360	1 1364
CMPG2205	05,2337	175	1 174	COF	E6,1742	= 111	46 111 403	CONCAUL	36,2230	542	1 542
CMPG2206	05,2076	= 175	1 174	COFMAXGC	22,2170	392		CONICS	12,2000	= 26	3 1242 1259
CMPG2207	05,2101	= 175	1 174	COFSKEW	E6,1710	= 111	8 110 394	CONICS1	04,2000	= 25	3 1255 1271
CMPOS	34,3124	572	2 568 572	COGA	E7,1774	= 123	18 123 1268	CONICX1	E7,1734	= 124	5 124 866
CMPOWEDL	05,2001	= 166	1 175	COGAFBIT	4707	= 60		CONSTO	25,3224	818	1 805
CMPOWEO1	05,2047	166	5 166 174	COGAFLAG	0203	= 59	4 890 1257	CONSTO1	25,3243	818	1 819
CMPOWEO2	05,2056	167	6 166 174	COGAMAX	0016	= 1272	4 1263 1266	CONTBL2	01,3657	1381	2 1383
CMPOWEO3	05,2063	167	6 166 174	COGAMIN	0010	= 1272	3 1264 1266	CONTCHK	27,2363	574	1 574
CMPOWEO4	05,2065	167	5 166 175	COGAOVFL	12,2767	1256	2 1256 1268	CONTDRVE	10,2020	161	1 161
CMPOWEO5	05,2067	167	3 166 171	COGLOLIM	04,3522	1255	1 1267	CONTINU	43,3613	1366	5 1365 1366
CMPOWEO6	05,2076	167	4 166 175	COGUPLIM	04,3520	1255	2 1264	CONTINU2	25,3126	816	1 816
CMPOWEO7	05,2101	167	5 166 175	COLINEAR	04,3620	1258	1 1258	CONTIN33	33,3531	441	1 440
CMPX1	E5,1455	= 96	2 430	COLREG	1102	= 75	7 75 1314	CONTMANU	22,3206	407	1 406
CMRENDDL	05,2147	= 170	1 175	COMADRS	43,3530	1364	2 1366	CONTONE	20,2323	688	2 687 688
CMRENDO1	05,2047	= 170	1 170	COMFLAG	5442	1450	1 1450	CONTTWO	20,2324	688	2 688
CMRENDO2	05,2056	= 170	2 170	COMGECM1	23,2000	= 28	1 278	CONT1	25,3057	815	1 815
CMRENDO3	05,2063	= 170	2 170	COMGECM2	10,2000	= 26	1 282	CONT3	25,3067	815	1 815
CMRENDO4	05,2065	= 171	1 170	COMMAND	E3,1471	= 82	6 1384 1389	CONUMNOR	41,3064	339	1 338
CMRENDO5	05,2067	= 171	1 170	COMMANDC	1305	77	6 162 164	CONVRNGE	27,2474	575	2 575
CMRENDO6	05,2076	= 171	1 170	COMMFX	43,3522	1364	2 1366	CON1	5332	1374	1 1374
CMRENDO7	05,2101	= 171	1 170	COMMNOUT	12,2752	1256	1 1269	CON2	10,2443	1376	1 1374
CMTMFILE	15,3724	1058	1 1057	COMMONLM	12,3430	1265	1 1266	CON2ADR	5347	1374	1 1374
CMTMTIME	0304	= 69	3 69 1058	COMNEG	07,2721	1389	1 1388	COPIES	10,3063	1437	1 1430
CMTR1	37,3564	837		COMP	7637	1118	4 1085 1148	COPIES2	10,3064	1437	1 1435
CMTR2	37,3635	838		COMPAT	15,3313	1049	2 1048 1049	COPINDEX	0164	= 1447	23 1431 1445
CNGL	22,2375	396		COMPDISP	35,3207	494	1 494	COPMPAC	0157	= 1447	3 1443 1446
CNTCHK	27,2361	574		COMPGS	33,3240	435	1 435	COPYNORM	10,3062	1437	1 1434
CNTNUP30	35,3655	626	3 625 626	COMPICK	41,2510	326	1 326	COPYPACS	10,2550	1431	1 1440
CNTR	E6,1447	99	25 638 905	COMPNAT	13,2061	500		COPYTOGO	10,2546	1431	1 1440
CNTRCHK	43,3463	1363		COMPNATX	27,2160	385	1 387	COPY40.9	16,2345	677	
CNTRCON	4726	= 1360	1 1363	COMPNFSN	27,2237	386	1 386	CORANGOV	37,3665	838	4 837 838
CNTRCOPY	16,3122	905	2 903 917	COMPNUMB	0300	69	11 69 1469	CORCOPY	16,3110	905	1 917
CNTRLOOP	43,3464	1363	1 1364	COMPOS	07,2654	1388	1 1388	COREINC	01,3054	1183	2 1179 1183
CNTRTMP	E6,1707	= 102	4 102 905	COMPTBIT	4703	= 53		CORFOUND	01,2661	1179	
COAALIGN	33,2302	419	3 414 419	COMPTEST	41,2423	324	6 324 337	CORPLAN	15,2446	735	2 734 735
COARFINE	14,3011	713		COMPTGO	35,3564	624	2 471 624	CORSCHK2	07,2707	1389	2 1388 1389
COARS	07,2612	1387	1 1387	COMPTST1	41,2425	324	1 325	CORSETUP	16,3053	904	2 903 917
COARSERR	07,2712	1389	2 1388	COMPUTER	0122	= 53	4 483 1293	COSCDU	0744	= 71	5 71 1331
COARSLOK	06,3055	156	1 157	COMPVER	33,2000	413	2 208 240	COSCDUX	0750	= 71	6 533 927
COARSTOL	07,2720	1389	1 1389	COMP12	22,2203	393	1 392	COSCDUY	0744	= 71	5 715 1336
COARS1	07,2617	1387	1 1387	CONTERM	11,2755	1305	1 1308	COSCDUZ	0746	= 71	7 533 1336
COARS2	07,2642	1388	2 1388 1389	COMZERO	07,2731	1389	2 1388 1389	COSF	0030	= 1273	4 1268 1269
COB	0040	= 1218	4 1213 1214	COM52	13,2260	728	3 727 730	COSG/2	E7,1667	= 116	5 116 810
CODE	0124	= 66	15 309 363	CONC+S1	43,3236	1360	1 1364	COSI	26,3633	1218	2 1214

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SYMBOL	DEF	H	REFERENCES	SYMBOL	DEF	H	REFERENCES	SYMBOL	DEF	H	REFERENCES
COSINE	00,3516		1154 2 1085 1330	CSTH-RHC	E5,1737	=	93 4 93 1264	==========			
COSM	E6,1511	=	109 4 109 1038	CSUBT	34,3734		882 1 846	D	E7,1637	=	115 22 115 823
COSO	E6,1513	=	109 3 109 1039	CSUN	0020	=	702 1 702	DACLIMIT	21,2526		981 3 980
COSOCOSM	E6,1515	=	109 2 1038	CTHETA	1156	=	75 2 410 990	DACLOOP	21,2463		980 1 980
COSPHI/2	0022	=	1318 6 1305 1307	CTLIST	0334	=	1066 6 1064	DACNDLS	21,2375		977 1 975
COSPHIE	11,3144		1307 1 1305	CULTBIT	4704	=	49	DAD	6744		1098 1 1083
COSTALIN	0000	=	202 6 202	CULTED	14,2476		706 4 706	DANZIG	6030		1075 73 278 1479
COSTH	0020	=	70 16 280 1323	CULTFLAG	0065	=	49 8 281 728	DAPBIT1	0132	=	54 2 687 1034
COS15	26,3317		832 1 795	CULTRIX	E5,1735	=	92 1 706	DAPBIT2	0133	=	54 2 687 1034
COS33	14,2503		707 1 705	CURTAINS	5646		1459 6 711 723	DAPCK	34,3252		581 1 581
COUNT	0143	=	67 12 309 355	CVECTR	0010	=	1218 1 1214	DAPDATR1	E6,1466		99 72 167 1034
COUNTPL	E5,1552	=	96	CXOFF	E5,1745	=	94 4 94 596	DAPDATR2	E6,1467		99 6 272 686
COVCNV	42,3635		884 1 884	CYCLEBIT	4701	=	47	DAPDISP	43,2541		246 1 229
COZY4	E7,1627	=	119 5 120 480	CYCLESW	0043	=	47	DAPDISP1	42,2000		246 1 246
CPHI	1155	=	75 9 245 990	CYCLSHFT	43,3472		1364	DAPFIG	42,3521		686 1 244
CPHIBIT	4674	=	43	CYL	0022	=	36 24 310 1364	DAPINIT	20,3075		933 2 899 938
CPHIFLAG	0000	=	43 2 765 1324	CYR	0020	=	36 46 197 1380	DAPINIT5	17,2211		899 1 899
CPHIX	1333		78 10 237 991	CZERO	E6,1742	=	103	DAPMASS	05,2000	=	26 1 910
CPSI	1157	=	75 1 410	CZSTORE	20,2744		929	DAPROLL	16,2000	=	27 3 901 949
CREWMANU	43,2533		245 1 229	C001	26,3265		832 1 805	DAPS1	20,2000	=	28 1 1034
CRITCON	40,2216		311 1 310	C1	E6,1571	=	101 3 101 931	DAPS2	20,2000	=	28 2 919 942
CRSTOR	34,3532		585 1 585	C1/16	27,3327	=	830 1 810	DAPS3	21,2000	=	28 3 688 993
CRSTOR1	34,3535		585 1 585	C1/2	7666		1169 1 1174	DAPS4	17,2000	=	27 2 960 1007
CRS61.1	34,3227		580 1 562	C1TMP	E6,1717	=	104 2 929 931	DAPS5	17,2000	=	27 1 1029
CRS61.2	34,3325		582	C12	26,3205		831 1 810	DAPS6	20,2000	=	28 3 674 687
CRS61.2A	34,3406		583	C18	26,3163		830 1 815	DAPS7	17,2000	=	27 3 674 896
CSCDES	06,3125		157 1 155	C2	E6,1572	=	101 1 101	DAPS8	22,2000	=	28 1 1005
CSCIOMAN	06,3133		157 1 157	C2TMP	E6,1720	=	104 1 929	DAPT5	20,3402		938
CSCTOZOP	06,3130		157	C20	26,3215		831 1 817	DAP1BIT	4674	=	54
CSI/CDH	35,2000	=	30 1 453	C21	26,3217		831 1 815	DAP2BIT	4675	=	54
CSMCONIC	13,3045		1284 9 540 884	C3	E6,1573	=	101 3 101 931	DATAPL	E5,1502	=	96 10 416 420
CSMMASS	E6,1474	=	99 17 193 911	C3/2	7706		1170 1 1174	DATATEST	E7,1603	=	118 1 127
CSMPOS	1206		77 11 77 598	C3TMP	E6,1721	=	104 1 931	DB	16,3722		957 4 949 952
CSMPREC	13,3022		1284 7 32 886	C33JMP	06,2745		154 1 141	DBARTRIM	24,2767		652 1 652
CSMSTORE	22,3402		488 2 488 540	C33TEST	06,2367		140 6 137 139	DCDU	E6,1603	=	106 8 106 1336
CSMUPP	34,3035		571 1 568	C4	E6,1574	=	101 1 101	DCDUINCR	21,2351		975
CSMVEC	43,2705		253 1 230	C4RTE	35,3755		882 1 842	DCMTCCDU	22,2655		401 2 386 405
CSS	0016	=	707 1 706	C4TMP	E6,1722	=	104 1 929	DCOGA	0014	=	1272 4 1265 1266
CSSUN	15,2201		703 1 702	C45LIM	15,3213		1046 2 1044	DCOMP	7654		1118 2 1118
CSS33	14,2511		707 2 706	C5	E6,1575	=	101 3 101 931	DCOMPTST	41,2436		325 2 324
CSS5	15,2177		702 2 701 702	C5/2	4742		1168 1 1174	DCONSTD	25,3213		818 2 811 812
CSS66	14,2505		707 1 705	C5TMP	E6,1723	=	104 1 931	DCTSTCYC	41,2451		325 2 339 340
CSS6640	14,2507		707 1 705	C6	E6,1576	=	101 1 101	DDV	7546		1116 1 1083
CSTEER	E7,1702	=	121 6 121 674	C6TMP	E6,1724	=	104 1 929	DDV/BDDV	00,2353		1129 1 1116
CSTH	E5,1733	=	93 13 93 1269	C7TMP	E6,1725	=	104	DDVCALL	00,3004		1140 1 1140

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SYMBOL	DEF	H	REFERENCES	SYMBOL	DEF	H	REFERENCES	SYMBOL	DEF	H	REFERENCES
DE-GR-50	30,2075		554 1 554	DELBARP	20,2523		924 1 963	DELTTIME	E5,1612	=	90 2 517
DEBIT	5453		1450 2 1450	DELBARY	20,3001		929 1 966	DELV	1162		76 10 76 799
DEC-12	04,3462		1173	DELBRTMP	E6,1715	=	102 11 103 932	DELVCTL	E7,1664	=	121 3 644 645
DEC-6	04,3461		1173	DELCDUX	E6,1575	=	106 6 106 976	DELVEE	E5,1622	=	91 5 91 545
DECBRNCH	1000		72 18 309 357	DELCDUY	E6,1577	=	106 4 106 584	DELVEET3	E7,1645	=	120 16 120 665
DECDSP	41,2520		326 1 318	DELCDUZ	E6,1601	=	106 4 106 584	DELVEC	E5,1632	=	91 3 91 545
DECDSP3	41,2572		327 2 327	DELCOMP	22,2530		398 3 385 403	DELVIMU	E7,1674	=	121 7 121 645
DECEND	40,2166		310 2 310	DELDEP	E5,1761	=	93 5 93 1253	DELVLVC	E7,1404	=	114 10 274 853
DECON	40,2223		311 1 310	DELEL	E7,1451	=	119 5 119 462	DELVOV	E7,1537	=	119 4 275 501
DECOUNT	0117	=	66 27 320 343	DELELC	0032	=	453 3 459 462	DELVREF	E7,1432	=	114 8 644 801
DECRET	0115	=	66 2 339 340	DELHITE	E7,1753	=	123 2 274 540	DELVSAB	E7,1653	=	120 3 120 663
DECRM61	37,2575		563 3 562 563	DELINDEP	0014	=	1273 2 1252 1253	DELVSIN	E7,1645	=	120 11 120 848
DECROUND	40,3164		352 1 351	DELLOCP	00,3733		1452 1 1452	DELVSLV	E7,1404	=	114 4 114 629
DECTEM	0122	=	66 3 326	DELLT4	E7,1422	=	114 11 114 665	DELVSUM	E6,1750	=	104 6 104 678
DECTEST	41,2442		325 2 324 325	DELM	E5,1560	=	96 5 430 431	DELVSUMP	E6,1756	=	104 2 652 653
DECTOBIN	40,2133		310 1 310	DELMLP	33,2711		430 1 430	DELVTPF	E5,1636	=	90 5 90 518
DECTWO	35,3143		475 3 465 546	DELOGA	E6,1677	=	102 5 102 952	DELVTPI	E5,1634	=	90 5 90 518
DEC182	30,3653		603 1 598	DELOGAC	16,3355		950	DELVX	1162	=	76 13 290 785
DEC15	4721	=	830	DELOGART	E6,1675	=	102 7 102 952	DELVY	1164	=	76 10 292 785
DEC17	4375	=	422 2 414 434	DELOK	12,2637		1253 1 1252	DELVZ	1166	=	76 9 292 785
DEC227	15,2452		735 1 734	DELOOP	21,2352		975 1 976	DELX	E5,1642	=	93 6 93 1247
DEC23	43,2362		239 1 239	DELOPCMD	10,2166		164 2 163	DELYBAR	E6,1623	=	101 7 101 932
DEC409	20,2274		687 1 685	DELPBAR	E6,1621	=	101 7 101 926	DEP	0036	=	1273 1 1252
DEC45	4727		1168 3 938 1161	DELRDCNE	32,2057		633	DEPREV	E5,1763	=	93 2 93 1252
DEC46	20,2275		687 1 685	DELRSPL	32,2017		632 1 509	DESOPMOD	1315		78 2 155 158
DEC51	07,3572		1407	DELRSPL1	32,2000	=	30 1 632	DESOPTS	1161		76 5 95 697
DEC57	4374	=	422 1 416	DELSTOR	34,2453		534 1 533	DESOPTT	1160		76 7 95 697
DEC585	33,3111		433 1 417	DELT	E5,1644	=	93 3 93 1245	DEXDEX	0142	=	68 7 1329 1335
DEGCOM	40,2566		329 1 328	DELTACSM	E3,1572		83 3 572 619	DEXI	0143	=	68 1 1334
DEGCON1	40,2757		342 1 341	DELTAL	E4,1727	=	87 4 87 887	DEXI	0143	=	68 5 68 1334
DEGCON2	40,2761		342 1 342	DELTALEM	E3,1644		83 1 572	DEX2	0144	=	68
DEGINSF	40,2714		341 1 341	DELTAQ	E7,1523	=	118 5 118 1221	DFAILY	17,2741		1009 1 1009
DEGINSF2	40,2725		341 1 343	DELTAR	E5,1610	=	90 5 90 517	DFRNT	40,3267		355
DEGOUTSF	40,2516		328 2 327 328	DELTAT	E7,1725	=	124 2 124 125	DFT	E6,1547	=	105 7 105 1025
DEGREE1	14,3057		714 1 713	DELTATCK	27,3556		1468 1 1468	DFTMAX	17,3336		1021 4 1018 1021
DEGREE10	34,3551		585 1 581	DELTATT	21,2141		971 1 989	DFTMOON	36,2022		540 1 544
DEGTAB	40,2576		329 2 328 329	DELTATT2	21,2142		971 3 971 990	DFT1	E6,1550	=	105 4 105 1019
DEG359	14,3060		714 1 713	DELTATT3	17,2663		1008 1 1007	DFT2	E6,1551	=	105 4 105 1020
DEL	E7,1425	=	118 12 385 405	DELTAX	1256	=	77 19 77 1226	DHOOK	E7,1655	=	115 5 115 816
DELATT20	17,2664		1008 1 1007	DELTEE	E7,1743	=	123 8 123 545	DHOOKYQ7	25,2776		813 2 808 813
DELAYEX	5172		1191 1 1190	DELTEEC	E7,1447	=	119 5 119 462	DIFCHK	10,2220		227 3 227
DELAYJOB	00,3730		1452 13 193 1034	DELTEMPX	E6,1515	=	105 5 105 974	DIFEQ+0	11,3371		1312 1 1308
DELAYLOC	1141		75 7 186 1452	DELTEMPY	E6,1517	=	105 3 105 973	DIFEQ+1	11,3375		1312 1 1308
DELAYNUM	6214	=	32 1 1452	DELTEMPZ	E6,1521	=	105 2 973 974	DIFEQ+2	11,3406		1312 1 1308
DELAY200	21,2524		980 1 980	DELTIME	12,2426		1250 3 1245 1265	DIFEQCNT	E3,1500		82 25 82 1314

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DIFEQCON	11,3551		1314 2 1312	DNDUMP2	05,3562		1068 1 1068	DOSWITCH	11,3300		1309 2 1308 1309
DIFEQTAB	11,3152		1308 1 1307	DNECADR	0336	=	1066 15 1063 1066	DOT	7300		1110 1 1083
DIFEQQ	11,3245		1309 1 1313	DNEDUMP	43,2710		253 2 229 253	DOTERM	40,3500		369 1 368
DIFF	E7,1607	=	115 7 115 818	DNLADMM1	04,2476	=	201 1 196	DOTICK	23,2542		507 1 507
DIFFOLD	E7,1611	=	115 5 115 818	DNLADPCO	4714	=	202 1 195	DOTINC	0136		67 7 67 1111
DIMOBIT	4712	=	50	DNLSTADR	0332	=	70	DOTIXBR	01,2451		1160
DIMOFLAG	0073	=	50 20 203 1314	DNLSTCOD	0332		70 8 70 1470	DOTPER	23,2740		512 1 512
DIRADRES	6055		1076 2 1090	DNPHASE1	05,3340		1063 2 187 1068	DOTRET	0137		67 8 67 1150
DISGET	31,3222		886 1 886	DNPHASE2	05,3346		1063 1 1065	DOTSUB	7125		1105 3 1111
DISLID	31,3356		888 1 888	DNQ	0337		70 1 1066	DOTVCON	24,2611		649 1 207
DISPDEX	0000	=	79 2 471 472	DNRNGERR	E7,1715	=	116 4 116 822	DOTVCRCS	24,2724		651 1 208
DISPLACE	41,3061		338 2 338	DNTABLE	05,2342		175 1 1064	DOUBLK	40,2476		315 2 314 315
DISPLAYE	35,3073		473 2 453 454	DNTMBLFF	0340		70 28 127 1068	DOVLOAD	6432		1090 1 1087
DISPLAYS	10,2000	=	26 2 1429 1458	DNTMEXIT	05,3524		1066 6 1064 1069	DOVLOAD*	6435		1090 1 1087
DISPMGA	35,3544		624 1 627	DNTMFAST	06,2653		151 1 154	DOV5N71	30,2132		554 1 554
DISPN5X	35,3163		494 1 494	DNTMGCTC	0335		70 7 184 1068	DOW..	11,3610		1316 2 1309 1314
DISPTARG	27,2613		767 2 759	DNTM1	0034	=	38 1 1066	DOW..1	11,3636		1316 2 1316
DISP45	35,3547		624 1 624	DNTM2	0035	=	38 1 1066	DOWNCNTL	25,3252		818 1 815
DISTEM	0122	=	66 3 324	DOALARM	5112	=	1459	DOWNENT2	7735		1449 3 1438 1444
DISTLS	31,3272		887 1 887	DOBRATE	15,2521		1032 1 1032	DOWNFLAG	5447		1450 60 194 1441
DISTTL	31,3376		888 2 888	DOBRATE7	15,2506		1032	DOWNTELM	05,2000	=	26 2 165 1063
DIVIDE	31,2756		619 7 616 617	DOBRATE1	15,2522		1032 1 1032	DP(-22)	27,3323		1352 1 1347
DLAYJOB	00,2000	=	25 1 1452	DOCSM	36,3751		1227 1 1226	DP-.002	36,2024		540 1 541
DLEWD	E7,1641	=	115 4 115 814	DOCSM1	36,3754		1227 1 1226	DP-.01	35,3144		475 3 471
DLEWDO	26,3155		830 1 814	DODELVZ	37,3212		784 1 785	DPADD	21,2040		967 1 976
DLOAD	6021		1074 1 1083	DODLOAD	6427		1090 1 1087	DPADD+	21,2060		967 1 967
DLOAD*	7702		1170 1 1078	DODLOAD*	6113		1078 2 1087 1090	DPADD-	21,2062		968 1 967
DLOADCOD	7701		1170 1 1090	DODNADR	05,3347		1063	DPADD2+	21,2065		968 1 967
DLY2	5147		1190 2 1190 1452	DODNCHAN	05,3415		1064	DPAGREE	7224		1108 1 654
DMENFBIT	4702	=	53	DODNPTR	05,3434		1065 1 1064	DP8-14	27,2326		387 2 385 387
DMENFLG	0121	=	53 12 570 1227	DODOWNTM	05,3331		1063 2 126 127	DP8-9	17,2010		674 1 673
DMODE	7301		1110 1 1149	DOFSTART	05,2370		178 5 181 184	DPBIT14	01,3476		1201 1 1201
DMP	7052		1103 15 310 345	DOGAMDCT	37,3577		837 1 837	DPHALF	26,3327	=	1172 12 392 532
DMPINCP2	30,3053		595	DOJET	21,3732		1003 3 1001 1003	DPINCOM	40,3034		343 1 343
DMPINTEG	30,2375		589	DONEADR	37,3257		785 1 784	DPINCRM	40,3042		343 1 343
DMPNSUB	7265		1109	DONOUN46	42,2004		246 1 246	DPINSF	40,3017		343 4 341 343
DMPNTEMP	0135	=	67 2 1109	DONOUN47	42,2022		246 1 247	DPINSF2	40,3044		343 1 341
DMPR	7543		1116 1 1083	DONOUN48	42,2046		247 3 247	DPINSF4	40,3051		343 1 341
DMPSUB	7056		1103 22 1105 1334	DOPROC	40,3502		369 2 368 379	DPIPAY	E5,1532	=	96 3 429 434
DMPSUB2	7075		1103 1 1108	DORSTART	05,2543		181 1 181	DPIPAZ	E5,1536	=	96 1 429
DMP1	7541		1116 1 1083	DOSPSOFF	24,2716		650 1 209	DPMODE	22,3713		1478 3 492 878
DNADRDCR	05,3354		1064 1 1066	DOSSHFT	00,2322		1127 1 1127	DPNDX	E6,1507	=	105 25 105 998
DNDUMP	05,3545		1068 1 1068	DOSTORE	6331		1086 1 1075	DPOSMAX	4671		1167 3 351 1478
DNDUMP1	05,3532		1068 2 253 1068	DOSTRULL	24,2637		649 1 207	DPOUT	40,2627		330 3 329
DNDUMP1	05,3560		1068 1 1068	DOSUBLST	05,3510		1066 1 1065	DPPOSMAX	26,3337		1172 12 419 889

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SYMBOL	DEF	H	REFERENCES	SYMBOL	DEF	H	REFERENCES	SYMBOL	DEF	H	REFERENCES
DPTEST	41,2261	320	4 320 340	DSPCOM2	41,2404	324	2 324	DSQSUB	00,3300	1150	5 1147 1155
DPTEST1	41,2300	321	4 321	DSPCOM3	41,2412	324	1 324	DSREL	0141	= 67	4 354 355
DPZERO	04,3452	= 1317	3 705 1309	DSPCOUNT	0777	72	66 131 1413	DSRUPTEM	0073	= 65	5 130
DP1/2	04,3450	= 1206	5 1206 1218	DSPDCEND	41,2563	327	4 327 333	DSRUPTSW	1302	77	11 127 186
DP1/20	37,3365	787	1 786	DSPDCGET	41,2524	326	1 326	DSTORE	25,2162	799	1 802
DP1/4	11,3700	1317	3 1269 1317	DSPDCPUT	41,2534	326	1 327	DSU	6754	1100	1 1083
DP1/4TH	26,3321	1172	4 31 1221	DSPDCWD1	40,3136	351	4 352	DSUM	20,3217	935	2 924 929
DP1/6	26,2104	730	1 729	DSPDC2NR	40,3171	352	3 332 353	DSUMSC	20,3373	937	
DP1MIN	23,3136	606	1 606	DSPDECNR	40,3165	352		DSUMTMP	E6,1713	= 102	37 102 937
DP1OUTSF	40,2614	329	1 327	DSPDECVN	40,3211	353	4 330 368	DT/TAU	22,3141	406	1 405
DP2(-3)	27,3325	1352	1 1349	DSPDECWD	40,3131	351	4 327 331	DT/2	E4,1713	= 87	11 87 1314
DP2(-4)	27,3327	1352	3 760 1343	DSPDELAY	35,3154	494	1 494	DT/2COMP	13,3275	1288	1 1289
DP2/3	11,3716	1317	3 1298 1317	DSPDPDEC	40,2675	334	1 318	DT/2MAX	13,3367	1289	2 1288 1289
DP2OUTSF	40,2621	329	2 327	DSPFLG	1067	= 1447	3 1440 1441	DT/2MIN	13,3365	1289	1 1289
DP3OUTSF	40,2623	329	1 327	DSPFMEM	41,3343	350	1 319	DTEARCT	E7,1605	= 115	8 115 800
DP9/10	04,3510	1255	4 1246 1253	DSPIN	40,3225	354	5 309 355	DTHETASM	E6,1611	= 106	11 106 1336
DQUARTER	11,3700	= 1317	2 1303	DSPIN1	40,3252	355	2 354 355	DT2IPR	E7,1647	= 124	5 124 861
DRCON	E7,1665	= 124	6 124 862	DSPLAY	06,2047	130	1 130	DUMMYAD	04,2132	194	1 199
DRFTBIT	4674	= 46		DSPLIST	1043	73	6 187 375	DUMMYJOB	01,3223	1187	2 180 1186
DRFTSUB2	06,3461	295	1 299	DSPLOCK	1012	73	12 187 1445	DUMPCNIC	27,2767	1341	
DRHO	E6,1552	= 105	6 105 974	DSPLV	41,3403	353		DUMPCNT	0333	70	1 1068
DRHOLOOP	21,2202	972	1 973	DSPLY58	04,3305	518	1 518	DUMPFISH	26,3043	763	
DRHO1	E6,1554	= 105	1 106	DSPLY81	04,3310	518	1 518	DUMPLOC	0336	= 70	5 1068
DRHO2	E6,1556	= 106	1 106	DSPMM	04,2537	367	1 378	DUMPP61	26,2261	741	
DRIFTFLG	0036	= 46	3 714 780	DSPMMJB	40,3435	368	2 367 1368	DUMPRPRA	27,3025	1343	
DRIFTI	E5,1514	= 96	1 416	DSPMMJOB	40,3435	= 1368	1 1368	DUMPTFF1	27,3110	1347	
DRIFTO	E5,1512	= 96	1 418	DSPMMTEM	0140	= 67	2 368	DUMPTFF2	27,3205	1348	
DRIFTSUB	06,3441	295	3 292 293	DSPMSK	4716	= 354	1 353	DUMPTRIG	27,2611	767	
DRIFTT	E5,1452	= 96	2 414 417	DSPOCTIN	40,3315	355	1 353	DUMPVGAM	26,3072	765	
DSALMOUT	0011	= 38	36 144 1471	DSPOCTWD	41,3353	353	3 318 350	DURATION	16,3321	949	
DSEXIT	0114	= 66	3 354 355	DSPOFF	05,3063	186	1 186	DV	E7,1705	= 124	9 124 879
DSKYBIT	4674	= 52		DSPOUT	06,2063	130	2 129	DV/SC	7605	1117	2 1117
DSKYFLAG	0113	= 52		DSPOUTSB	06,2024	130	2 130 132	DVCALC	32,3673	878	3 873 876
DSLV	40,3301	355	2 355	DSPRND	40,3120	351	1 351	DVCNTR	E7,1431	= 114	18 32 779
DSMAG	0142	= 67	2 355	DSPSCAN	06,2032	130	2 130	DVECTR	0010	= 1218	1 1214
DSMSK	40,3303	355	2 355	DSPSFNOR	41,2557	327	1 327	DVL	E7,1661	= 116	8 116 816
DSPA	41,2364	324	1 318	DSPSIGN	40,3103	351	4 351 352	DVLOS	E5,1610	= 90	10 90 467
DSPAB	41,2357	324	1 318	DSPTAB	1023	73	49 129 1458	DVNORM	00,2505	1132	3 1131
DSPABC	41,2352	324	1 318	DSPTEMX	1051	= 73	5 73 493	DVNORMCT	0137	= 67	6 1129 1140
DSPABORT	4243	365	3 365	DSPTEM1	1045	73	40 73 887	DVOK	16,3514	952	1 952
DSPALARM	40,3323	356	5 318 341	DSPTEM2	1050	73	12 73 422	DVOVF	00,2405	1129	11 1131 1142
DSPB	41,2372	324	1 318	DSPWDRET	0144	= 67	3 351	DVSIGN	0136	= 67	10 1129 1146
DSPC	41,2377	324	1 318	DSP2BIT	41,3406	354	1 357	DVTHRESH	1353	80	1 673
DSPCNT	0776	72	7 130 187	DSP2DEC	40,3176	352	1 334	DVTHRUSH	4717	= 781	
DSPCOM1	41,2370	324	3 324 326	DSQ	00,3174	1147	1 1085	DVTOTAL	E7,1425	= 114	7 114 779

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SYMBOL	DEF	H	REFERENCES	SYMBOL	DEF	H	REFERENCES	SYMBOL	DEF	H	REFERENCES
DVTOTUP	37,3042		779 1 779	E/PROG	04,2000	= 25	2 411 413	EGSW	0141	= 55	3 55 821
DVXSC	7377		1113 2 1112	E/SWITCH	04,2574	411		EIGHT	4707	= 1171	2 903 904
DV47TEMP	E7,1457	= 121	2 644 645	EARRCT1	23,2215	287	1 797	EISDT	42,3612	884	2 884
DWNRPTBB	4060		127 1 126	EARRCT2	23,2225	287	3 287 800	EJSCAN	01,3141	1185	2 1182 1185
DXCHT12	17,3626		1028 1 1027	EARSPF	11,3260	1309	1 1308	EJ1	01,3206	1186	6 1185
DXCHT23	17,3632		1028 1 1027	EARTCNTR	14,2234	701		EJ2	01,3216	1186	1 1186
DXCOMP	12,2130		1245 3 1247	EARTHGCN	23,2630	508	1 508	EKPRIME	E6,1413	98	2 898 904
DXITFIX	05,3330		912 1 910	EARTHL	26,3622	1217	2 1210 1212	EKTLX/I	E6,1416	98	1 897
DXTEST	05,3223		910	EARTHMU	16,2376	678	1 677	ELAPTIME	31,3414	889	2 886 887
DYNDISP	24,3241		657 1 656	EARTHMX	26,3570	1216	2 1210 1212	ELCALC	35,2232	459	1 462
DZCALL	15,3671		1056 2 1050 1051	EARTHMXX	0051	= 1218	4 1213 1216	ELEPS	35,3141	475	1 459
DZCALL1	15,3675		1056 1 1049	EARTHPAD	23,2463	506	1 506	ELEV	E7,1743	= 123	9 123 462
DZCOM	15,3647		1043 1 1043	EARTHR	33,2370	421	2 421 526	ELEVEN	4717	1167	9 160 1171
DZNOCOM	15,3650		1043 1 1043	EARTHR*	33,2417	421	5 416 436	ELEX	35,2507	462	1 459
DZ1	15,3376		1051 1 1050	EBANK	0003	= 36	69 181 1477	ELOOPFIN	43,3434	1363	2 1363
DZ2	15,3403		1051 1 1051	EBANKSAV	1067	74	3 1431 1447	ELRCODE	07,3716	1415	1 1414
D0	E7,1707	= 116	4 116 818	EBANKTEM	1071	74	6 179 1447	ELRCODE1	40,2057	309	1 308
D0EQ	25,2310		804 1 804	EBANK3	4744	= 1171	3 183 838	ELRSKIP	05,2556	182	
D1	20,3415		938 3 935	EBANK4	4700	= 1171	1 636	EMATRIX	E5,1570	= 90	3 599 601
D1/1024	04,3504		1255 1 1264	EBANK5	4751	1169	3 235 559	EMSALT	E4,1417	85	3 759 884
D1/128	04,3472		1255 3 1248 1259	EBANK6	4752	= 1171	11 183 795	EMSD	0055	= 37	
D1/16	04,3500		1255 2 1261 1268	EBANK7	4753	1169	6 251 795	ENABL1	16,3205	915	3 915 916
D1/256	04,3506		1255 3 1248 1255	EBACG	4752	= 795	4 837 1036	ENABL2	16,3215	915	1 917
D1/32	04,3502		1255 6 547 1268	EBDVCNT	34,2000	32	1 525	ENABT6	17,3761	1030	2 1030
D1/4	04,3476		1255 5 31 1268	EBDVCNTR	24,2000	32		ENATMA	43,2506	243	1 229
D1/64	04,3474		1255 5 1243 1269	EBENTRY	4753	= 795	4 755 826	END-DELV	E7,1425	114	2 114 118
D1/8	04,3470		1255 1 1269	EBMARKDC	07,2000	32		END-E3	E3,1767	= 84	
D2	20,3417		938 3 935 936	EBMRKBUF	07,2001	32		END-E4	E4,1777	= 89	
D2J2	20,3241		935	EBP40TMP	24,2001	32		END-E5	E5,1777	= 97	
D21	E6,1670	= 111		EBOPLACE	34,2001	32	1 525	END-E6	E6,1776	= 113	
D3	20,3421		939 3 936	EBRN1	37,2000	32		END-E7	E7,1777	= 125	2 209 737
D3J3	20,3263		936	EBUF2	0364	70	10 411 412	END-IN/M	E7,1631	= 120	2 120 124
D4	20,3423		939 3 936	ECC	E5,1753	= 93	2 93 1269	END-KALC	E7,1447	= 118	3 114 119
D4J4	20,3305		936	ECLIPCL	15,2167	702	1 702	END-P30S	E7,1664	= 121	2 121 122
D5	20,3425		939 3 937	ECORFRAC	E6,1422	98	1 904	END-SVCR	E7,1451	= 114	2 114 115
D5J5	20,3327		936	ECSTEER	E7,1424	= 114	5 170 841	END-UE	1377	= 80	
D6	20,3427		939 3 937	EDOP	0023	= 36	13 349 1364	END-W	E5,1642	= 90	3 92 94
D6J6	20,3351		937	EDOT	E6,1515	= 105	16 105 1002	ENDALL	40,2164	310	2 310 311
D6OR9BIT	4711	= 50		EDOTVEL	E6,1520	= 105	7 105 1000	ENDALM	4167	356	1 362
D6OR9FLG	0072	= 50	8 574 1314	EDRIVEX	E6,1503	99	4 112 980	ENDBLFF	4317	= 366	1 370
==========			==========	EDRIVEY	E6,1504	100	2 112 979	ENDBSUB1	40,3435	= 367	1 368
E(-AT)	20,3405		938 4 924 930	EDRIVEZ	E6,1505	100	2 112 979	ENDBUF	0324	= 69	3 69 1058
E/BKCALL	04,2557		411	EE	13,2457	1206	1 1206	ENDCHKG	33,2355	420	
E/CALL	04,2576		412	EGFLGBIT	4703	= 55		ENDDAMP	21,3405	996	1 996
E/JOBWAK	04,2612		413	EGRESS	E4,1717	= 87	14 87 1292	ENDOCM	22,2530	= 398	

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ENDDOT	7154		1105 1 1150	ENDRDLO	40,2674		330 1 334	ENGONBIT	4704	=	53
ENDDPDEC	40,2713		334 1 341	ENDRELDS	40,3406	=	360 1 366	ENGONFLG	0123	=	53
ENDDPUSH	6517		1092 1 1092	ENDREP11	34,2267		528 1 528	ENGREQST	24,3272		658 1 658
ENDECVN	40,3225	=	353 1 354	ENDRET	10,3463		1444 5 1439 1446	ENG2BIT	4700	=	45
ENDEN	36,2443		545 2 544 545	ENDROLL	22,3234		409	ENG2FLAG	0023	=	45 3 637 668
ENDEXIT	25,3570		824 2 745 814	ENDRQDAT	41,2315		321	ENTANSWR	07,2367		225 1 225
ENDEXT	5423	=	1447 39 231 1471	ENDRQWT	41,3505		358 1 362	ENTCADR	26,2427		746 1 746
ENDEXTVB	5423	=	231 7 234 236	ENDRSTRT	05,2463		180 2 184	ENTER	41,2002		316 2 309 356
ENDFIG	42,3561		687 1 687	ENDRTCUT	41,2612	=	327 1 335	ENTERJMP	40,2060		309 1 309
ENDFIND	5115		1177 4 1179 1183	ENDRUTIN	41,3220	=	341 1 347	ENTEXIT	0136	=	316 10 317 357
ENDGTSAL	33,3263		435	ENDR57	37,2424		559 2 558	ENTMASK	25,2113		797 1 795
ENDHMSS	42,3521	=	346	ENDSAM	14,2303		702 1 701	ENTMID1	13,3613		1294 1 1294
ENDIDLE	4223		365 1 1443	ENDSCALE	40,2747		342 5 341 343	ENTMID2	13,3607		1294 1 1294
ENDIGN	24,2647		649	ENDSLECT	17,3766	=	1030	ENTPASHI	41,2012		316
ENDIMU	07,3433		1402 3 1386 1391	ENDSPBIT	4676	=	54	ENTPASO	41,2035		317 3 316 364
ENDINST	4233		365 6 312 1442	ENDSPF	41,3352		350 1 353	ENTRET	0136	=	67 6 312 363
ENDINT	13,2607		1280 1 203	ENDSPMIN	42,3364		334 1 344	ENTRYDSP	0134	=	54 4 744 751
ENDIT	10,3501		1444 1 1441	ENDSPMM	04,2547		368 1 374	ENTRYSW	25,2114		797 1 795
ENDJETS	17,3616		1027	ENDSPCCT	40,3320		356	ENTRYUPD	0001	=	202 1 202
ENDJOB1	01,3124		1185 1 1177	ENDSTATE	11,3502		1313 1 1312	ENTRYVN	1263	=	77 7 77 824
ENDLAMB	16,2302		677	ENDSUMS	43,3000		256 1 1366	ENTSET	41,3560		363 2 363
ENDMANU	22,3237		409 1 402	ENDS4C.6	20,2141		684	ENTTIM2	04,3075		493 1 493
ENDMANUV	27,2051		382	ENDS4C.9	16,2357		677 1 678	EP	E6,1742	=	103 8 960 963
ENDMANU1	27,2052		382 2 381 383	ENDT(X)	27,3314		1351 1 1351	EPC1RTE	34,3753		882 1 856
ENDMARK	5423		1429 4 226 1447	ENDTASK	5173		1192 4 185 1198	EPC1ORTE	34,3775		882 1 876
ENDMARKS	07,2412		226 1 226	ENDTEST1	33,2267		418 2 422 433	EPC2RTE	34,3755		882 1 843
ENDMASSP	05,3266		911	ENDTFF	27,3202		1348 3 1348 1350	EPC3RTE	34,3757		882 1 844
ENDMAXDV	00,2624		1135 2 1135 1137	ENDTNCN	06,2270		137 1 137	EPC4RTE	34,3761		882 1 858
ENDMODE	07,3506		1403 1 1403	ENDTNCN2	06,2310		138 1 137	EPC5RTE	34,3763		882
ENDMCNDO	41,3336		349 1 349	ENDTPUSH	6521		1092 2 1092 1149	EPC6RTE	34,3765		882 1 860
ENDMRC	17,2053		897	ENDTSLC	00,2212		1124 1 1124	EPC7RTE	34,3767		882 1 861
ENDNMTST	40,2150		310 2 310	ENDTVCIN	17,2206		899	EPC8RTE	34,3771		882 1 862
ENDNUM	40,2160		310 1 310	ENDVLOAD	6460		1091 2 1093	EPC9RTE	34,3773		882 2 875 877
ENDNVBSY	04,2556		374	ENDVPUSH	6507		1092	EPHEM	26,2000	=	29 1 737
ENDNVSB1	41,3602		364 1 377	ENDVXV	6747		1098 4 1098 1115	EPREMM1	04,2475	=	201 1 201
ENDOFJOB	5112		1177 121 194 1467	ENDV97E	24,3513		662	EPSFOUR	35,3146		475 2 465 543
ENDOUT	10,3440		1443 2 1445	ENDV97P	24,3433		661	EPSILONL	E7,1776	=	123 2 1263 1265
ENDPASTE	4157		349	ENDV97T	24,3404		660	EPSILONT	1347		79 2 1245
ENDPINBF	4526	=	375	ENDV99P	24,3351		659	EP4(10)H	30,3661		665 1 665
ENDPINS1	40,3571	=	380 1 621	ENDV99PI	24,3343		659	EP4(10)L	16,2402		678 1 676
ENDPINS2	41,3712	=	378	ENDZOPT	06,3172		158 1 158	EP4(45)H	30,3657		665 1 665
ENDPLAC	14,2147		698 2 574	END2DEC	40,3210		352	EP4(45)L	16,2400		678 1 676
ENDPRCHG	01,3006		1181 2 1180 1186	END45	35,3560		624 1 624	ERAD	13,2461		1206 1 1209
ENDP50S	15,2143		693 2 710 721	ENEMA	05,2632		183 3 184 1459	ERADFBIT	4676	=	45
ENDP76	13,2155		502 2 500	ENGINOFF	24,2710		650 3 206 654	ERADFLAG	0021	=	45 15 449 1209

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SYMBOL	DEF	H	REFERENCES	SYMBOL	DEF	H	REFERENCES	SYMBOL	DEF	H	REFERENCES
ERADM	E4,1640	= 86	10 86 1209	ETDECAY	E6,1415	98	1 673	FAZAB	36,3663	1226	1 1227
ERASCHK	43,3334	1362	1 1361	ETERRCR	31,3523	890	2 890	FAZAB1	36,3711	1226	1 1226
ERASCON1	43,3227	1360	1 1362	ETPIFLAG	0046	= 47	7 47 462	FAZAB2	36,3715	1226	1 1226
ERASCON2	43,3230	1360	1 1362	ETRYDAP	15,2000	= 27	3 1031 1038	FAZAB3	36,3724	1226	1 1226
ERASCON3	43,3231	1360	1 1362	ETSWITCH	E6,1421	98	1 898	FAZAB4	36,3734	1226	1 1227
ERASCON4	43,3232	1360	1 1362	ETVCDT/2	E6,1420	98	2 897 903	FAZAB5	36,3743	1227	2 1227 1293
ERASCON5	43,3240	1360	1 1363	EXDAP	15,3053	1044	1 1042	FAZA1	36,3512	1224	
ERASCON6	4744	= 1360	3 1362 1363	EXDAPIN	15,3004	1042	1 1045	FAZB	36,3605	1225	1 1224
ERASER	10,3617	1446	1 1440	EXDAPOFF	43,2723	254	1 240	FAZB1	36,3610	1225	
ERASIC	4747	= 32	1 1068	EXDAP1	15,3116	1045	3 1045 1046	FAZB2	36,3636	1225	1 1225
ERASLOOP	43,3364	1362	4 1362 1363	EXDAP2	15,3143	1045	1 1044	FAZB5	36,3643	1225	1 1225
ERASTAL1	13,3452	1291	1 1291	EXDAP3	15,3110	1045	2 1045	FAZC	36,3651	1225	2 1225
ERASTAL2	13,3455	1291	1 1291	EXDAP4	15,3101	1045	2 1044	FBANK	0004	= 36	30 365 1452
ERASWAK1	13,3460	1291		EXDSPRET	10,2746	1435	3 234 236	FBANKMSK	4364	= 1082	2 1183
ERASWAK2	13,3462	1291		EXECBANK	5120	1177	8 1175 1177	FBIASSUB	06,3617	299	3 297
ERASZERO	0007	= 165	1 165	EXECCOPY	16,2741	902	2 902 917	FBR3	11,2410	1300	1 1314
ERCNT	0117	= 66	7 377 380	EXECPHS	16,3170	915		FCADDY	20,3460	943	1 942
ERCOM	40,3552	380	1 379	EXECTEM1	0061	= 65	4 1175 1183	FCADRMM1	04,2403	= 199	1 197
ERCOMP	E5,1647	= 97	4 437 526	EXECTEM2	0062	= 65	4 1178 1183	FCARD	20,3462	943	3 942 944
ERCOMPPL	33,3424	438	1 437	EXIT	6712	1097	1 1075	FCARD1	20,3463	943	
ERCOMP1	E5,1647	= 97	12 417 442	EXITEM	0114	= 66	7 338 339	FCARD2	20,3464	943	
ERCON	40,3565	380	1 379	EXRSTRT	16,3270	916	1 915	FCARD3	20,3465	943	
ERCOUNT	1365	= 79	3 79 1360	EXTENTST	16,3623	954		FCARD4	20,3466	943	
ERECTIME	E5,1646	= 97	1 425	EXTVBACT	1044	73	22 179 1455	FCARD5	20,3467	943	
ERECTIM1	E5,1646	= 97	3 435 437	EXTVBS	42,2000	= 31	2 246 686	FCARD6	20,3470	943	
EREPFRAC	E6,1423	98	2 673 898	EXTVERBS	43,2000	= 31	4 229 1463	FCSTART	30,2000	= 29	
ERESTORE	1360	= 79	11 79 1363	EY	E6,1742	= 103	7 964 966	FDAIDSP1	21,2401	977	
ERMINUS	40,3544	379		E1345678	43,3345	1362	1 1363	FDAIDSP2	21,3144	990	1 977
ERPLUS	40,3547	379	1 379	E2	E7,1645	= 120	4 540 541	FDAITOTL	21,3161	990	1 990
ERRBTMP	E6,1742	= 103	20 103 933	E3RTE	35,3771	883	1 843	FDOT	26,3641	1218	1 1213
ERRLIM	4676	= 938	2 933	E6SETTER	24,3311	658	3 650 661	FENG	24,2334	642	1 637
ERROR	40,3504	379	1 308	E7SETTER	24,3306	658	3 638 654	FETCH2WD	05,3476	1066	2 1063 1064
ERRORLIM	20,3112	933	2 922 927	==========				FFTAG1	4000	= 25	5 214 1450
ERRORS	43,3254	1360	1 1360	F	E7,1726	= 121	5 121 680	FFTAG10	4000	= 25	2 189 192
ERRORX	E6,1567	= 106	13 106 998	FACEREG	0154	= 1448	8 1438 1439	FFTAG12	4000	= 25	1 128
ERRORY	E6,1570	= 106	8 106 996	FACTOR	E7,1613	= 115	5 115 817	FFTAG2	4000	= 25	3 620 1381
ERRORZ	E6,1571	= 106	8 106 996	FACT1	E7,1615	= 115	5 115 816	FFTAG3	4000	= 25	1 1384
ERTHR	33,2401	421	1 421	FACT2	E7,1617	= 115	4 115 815	FFTAG4	4000	= 25	2 1429 1454
ERTHRVSE	32,2000	421	2 425 433	FAILDSP	24,3263	658		FFTAG5	6000	= 25	
ERVECTOR	E5,1404	95	4 417 421	FAILREG	0375	71	15 178 1458	FFTAG6	6000	= 25	1 1449
ESCAPE	0136	= 67	4 1156 1157	FAIL3	5563	1457	1 1457	FFTAG7	4000	= 25	2 1457 1458
ESCAPE2	0137	= 67	2 1156 1157	FAKEPRET	5121	1177	2 1175 1185	FFTAG8	4000	= 25	1 349
ESTICADR	33,2121	415	2 415	FALTOF	4404	371		FFTAG9	4000	= 25	
ESTIMS	33,2453	425	3 415 437	FALTON	4400	371	9 196 1471	FIGTIME	35,2274	460	
ESTROKER	E6,1412	98	6 201 942	FAZA	36,3506	1223	1 1225	FIG2EXIT	30,2321	588	

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SYMBOL	DEF	H	REFERENCES	SYMBOL	DEF	H	REFERENCES	SYMBOL	DEF	H	REFERENCES
FILDELV	E5,1474	= 96	1 96	FLASHCN	4443	372	4 317 1443	GAMDVX	32,3671	877	3 875 877
FILDELV1	E5,1474	= 97	8 97 435	FLASHSUB	10,3406	1443	3 1441 1442	GAMDV10	32,3474	875	3 871 872
FINALBIT	4705	= 47		FLGWRD10	0106	= 62		GAMDV15	32,3521	875	1 875
FINALDV	00,2625	1136	3 1129 1135	FLGWRD11	0107	= 63		GAMDV20	32,3525	875	2 875
FINALFLG	0047	= 48	7 470 847	FLUSHJET	6000	1033	3 1031 1034	GAMDV25	32,3530	875	1 877
FINCOPY	16,3255	916	1 915	FORCEV25	42,3516	346	2 346	GAMDV30	32,3540	875	1 875
FINDGIMB	27,2246	386	2 385 386	FOREHLNT	25,3014	814	2 805 814	GAMDV32	32,3560	876	
FINDTIME	01,3573	1379	2 1379	FORTYONE	13,3436	1290	1 1283	GAMDV33	32,3564	876	1 876
FINDVAC	5042	1175	34 178 1467	FOUR	4710	= 1171	23 290 1439	GAMDV35	32,3567	876	1 876
FINDVAC2	01,2626	1178	2 1175 1177	FOURSEC	17,2006	674	1 674	GAMDV40	32,3573	876	
FINEK2	43,2263	236		FOURTEEN	4333	= 1145	1 1142	GAMDV45	32,3600	876	
FINEONLY	14,3036	714	1 714	FOURTH	26,3321	= 832	2 799 831	GAMDV47	32,3624	876	1 876
FINETIME	4526	422	3 419 1411	FPX2	17,3415	1023	2 1023	GAMDV50	32,3630	877	2 876
FIRELCOK	16,3613	954		FRANDRES	05,2000	= 26	1 178	GAMDV55	32,3647	877	1 877
FIREPLUG	16,3617	954	1 954	FRCS2	24,2336	642	2 641	GAMDV60	32,3655	877	1 877
FIRSTBIT	4704	= 47		FREECHK	21,2161	972		GAMDV65	32,3662	877	2 877
FIRSTFLG	0046	= 47	4 653 677	FREECONT	21,3256	993	1 993	GAMMA	E7,1455	= 118	5 118 1223
FIRSTIME	12,2613	1252	1 1252	FREEFBIT	4710	= 44		GAMMAEI	E7,1770	= 117	7 116 853
FIRSTTIME	16,2322	677	1 677	FREEFLAG	0014	= 44	7 709 721	GAMMAL	E7,1770	= 116	4 808 811
FIRST3	7707	= 552		FREEFLNC	21,3035	987	1 986	GAMMAL1	0026	= 116	6 807 810
FISHCALC	26,3027	763	3 759 761	FREERET	0144	= 67		GAMMASB	E4,1722	= 87	2 273 885
FIVE	4715	1167	29 188 1466	FREETAU	21,3047	988	3 988	GAMRP	0010	= 1208	3 1204 1208
FIXCLPAS	40,2303	312		FRESHCAP	21,2530	982	1 971	GBIASX	E3,1460	= 81	
FIXCW	05,3232	910	3 902 910	FREVS	20,3461	943	1 942	GCOMP	E3,1471	82	19 82 719
FIXDELAY	5156	1190	13 649 1388	FSUBO	26,3647	1218	1 1213	GCOMPSUB	06,3412	294	6 292 293
FIXLOC	0120	66	42 258 1478	FULLDSP	41,3642	377	1 377	GCOMPSW	E3,1477	82	9 290 425
FIXRANGE	40,2555	328	1 328	FULLDSP1	41,3643	377	1 377	GCOMPVER	33,3426	440	1 413
FIXROOT	00,3452	1152	3 1151	FURST3	7707	= 586	2 552 581	GCOMP1	06,3525	296	1 296
FLAGFILL	0110	65		FV	E4,1601	= 86	13 86 1316	GCOMP4	33,3575	442	1 442
FLAGGCN	23,2400	505	1 505	FVACCADR	01,3765	1383	1 1380	GCOMP5	33,3611	442	4 440 444
FLAGOFF	35,2775	470	1 470	FX	E7,1652	= 115	8 115 823	GDESELCT	07,3430	1401	1 1396
FLAGON	35,2751	470	2 470	FXADRS	43,3554	1365	2 1366	GDT/2	1206	= 76	4 76 787
FLAGTABL	04,2356	198	1 198	FXFX	43,3540	1365	1 1366	GDTSETUP	20,2075	683	
FLAGWRD0	0074	= 43	17 195 1451	FYX2	17,3561	1026	2 1026	GDT1/2	1247	= 76	2 76 787
FLAGWRD1	0075	= 44	27 194 1459	F2RTE	0012	= 44	3 868 876	GEADDR	6105	1077	1 1077
FLAGWRD2	0076	= 46	20 185 1390	F2RTEBIT	4706	= 44		GENDDV	00,2570	1134	2 1133 1137
FLAGWRD3	0077	= 48	3 415 1390	==========	==========	==========		GENMARK	10,3147	1439	
FLAGWRD4	0100	= 50	30 187 1446	GAINCHNG	16,2731	902	1 902	GENMASK	0162	= 1448	4 1431 1444
FLAGWRD5	0101	= 52	16 130 1464	GAINDOWN	16,3013	903	1 903	GENPL	E5,1444	95	27 95 96
FLAGWRD6	0102	= 54	25 182 1005	GAIN1	21,3063	989	1 972	GENRET	E6,1770	= 112	5 112 563
FLAGWRD7	0103	= 56	27 194 1467	GAIN2	21,3101	989	1 974	GENSCL	00,2346	1128	2 1128
FLAGWRD8	0104	= 58		GAMA	E6,1722	= 109	3 109 837	GENSCR	00,2277	1127	4 1126 1148
FLAGWRD9	0105	= 60	14 197 990	GAMCOMP	11,2562	1302	3 1301 1302	GENSHFT2	00,2224	1125	1 1125
FLASHMGA	35,3714	627	1 627	GAMDIFSW	0136	= 54		GENSHIFT	00,2214	1125	1 1116
FLASHOFF	4447	372	6 237 1440	GAMDOT	E6,1723	= 109	7 109 1040	GENTRAN	5475	1454	13 221 1454

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SYMBOL	DEF	H	REFERENCES	SYMBOL	DEF	H	REFERENCES	SYMBOL	DEF	H	REFERENCES
GEOCOMPS	E5,1643	= 97		GET45	35,3033	471	3 471	GOINT	35,2702	469	2 462
GEOCOMP1	E5,1643	= 97	5 414 433	GIMDTEST	20,2077	683	1 684	GOLOADLV	43,2301	237	6 229 230
GEOCONS1	33,3713	444	1 435	GIMLOCK1	23,3324	1324	1 1323	GOLOC	0705	= 1383	30 1378 1383
GEOCONS2	33,3715	445	1 435	GIMTRIM	20,2126	684	3 683	GOMANUR	07,3547	1406	1 382
GEOCONS3	33,3717	445	2 435	GL+NOATT	40,3567	380	1 379	GOMARK	10,2461	1430	1 1447
GEOCONS4	33,3721	445	1 435	GLAMPTST	06,2502	143	1 143	GOMARKF	10,2465	1430	9 239 1447
GEOCONS5	26,3327	= 438	1 435	GLIMITER	25,3471	823	1 823	GOMARKFR	10,2504	1430	5 558 1447
GEOIMUTT	33,2030	414	1 434	GLINVERT	06,2473	143	1 143	GOMARKR	10,2501	1430	1 1447
GEOM	04,3570	1258	2 1257 1263	GLOCKCHK	06,2434	142	2 142	GOMARK2	10,2470	1430	3 561 732
GEOMSGN	E5,1674	= 93	7 93 1264	GLOCKMON	06,2427	142	1 140	GOMARK2R	10,2507	1430	
GEORGEJ	33,3705	444	2 431 432	GLOCKCK	5222	= 154	4 143	GOMARK3	10,2473	1430	
GEORGEK	33,3707	444		GLCKFAIL	0056	= 48	2 415 1324	GOMARK3R	10,2512	1430	
GEOSAVED	E5,1631	= 96		GLOKFBIT	4675	= 48		GOMARK4	10,2476	1430	1 225
GEOSAVE1	E5,1631	= 97	5 428 437	GMAX	E7,1721	= 116	3 116 760	GOMARS	10,2462	1430	
GEOSTRT4	5112	= 439	1 211	GMAX/2	26,3157	830	2 823	GOMAXL/D	25,3465	823	4 817 823
GET.LVC	04,2676	483	1 483	GMBDRBIT	4701	= 55		GOMOD	04,2200	195	1 196
GET+MGA	04,2660	483	3 471 627	GMBDRVSW	0137	= 55	1 55	GOMOVE	27,2336	389	1 389
GETAKS	21,3171	990	1 991	GMDIFBIT	4700	= 55		GONEBIT	4701	= 55	
GETANGLE	25,2217	800		GMERGE	07,3302	1398	1 1401	GONEBY	0160	= 57	4 800 822
GETARG	32,2036	632	1 633	GMODE	E4,1613	= 86	1 86	GONEGLAD	25,3463	823	3 822 823
GETCADR	01,3515	1202	1 1201	GN/CCODE	4736	1168		GONEPAST	0137	= 55	4 804 824
GETCOMP	41,2512	326	5 324 326	GOAGIN	10,3176	= 1447		GONXTBNK	43,3657	1366	3 1366
GETDHOOK	25,2525	808	1 808	GOALMCYC	41,2347	322	1 340	GOODEND	07,3467	1403	4 226 1403
GETDLEWD	25,2671	811	1 811	GOANIDLE	10,3267	1441	1 1441	GOPERFRS	10,3033	1437	
GETECC	12,3703	1269	1 1269	GOBAC	13,3450	1290	2 1290	GOPERFS	10,2753	1435	
GETERAD	13,2437	1206	4 616 1209	GOBAQUE	11,2706	1304	2 1307 1313	GOPERF1	10,2751	1435	7 610 1410
GETETA	26,3073	802	1 800	GOBB	4054	127	1 126	GOPERF1R	10,3031	1437	1 743
GETINREL	40,2225	311	4 309 314	GOBL/2	1214	= 76	3 76 782	GOPERF2	10,2756	1435	
GETLCX	15,3253	1049	1 1048	GOBL1/2	1255	= 76	3 77 786	GOPERF2R	10,3036	1437	1 381
GETMAXDT	13,3322	1289	1 1288	GODSP	10,2574	1432		GOPERF4	10,2761	1435	1 448
GETNEWNM	5354	1374	1 1374	GODSPALM	41,2350	322	20 316 363	GOPERF4R	10,3041	1437	1 692
GETOFF	15,3471	1052	1 1052	GODSPR	10,2602	1432	3 382 756	GOPIN	43,2125	231	28 232 687
GETOFF2	15,3515	1053	1 1052	GODSPRET	10,2577	1432	3 440 719	GOPLAY	10,3216	= 1447	1 1435
GETON1	15,3432	1051	1 1051	GODSPRS	10,2765	1436	8 1430 1437	GOPOOFIX	04,2000	189	1 189
GETON2	15,3455	1052	1 1052	GODSPRS1	10,2767	1436	1 1432	GOPOSLAD	25,3516	823	1 823
GETOPCMD	10,2047	162	1 163	GODSPR1	10,2603	1432		GOPROG	05,2511	181	2 126 127
GETPART2	01,3533	1378	1 1383	GODSPR2	10,2604	1432	2 1430 1433	GOPROG2	05,2632	= 184	1 195
GETPRIO	5350	1374	2 1374 1377	GODSP2	10,2575	1432		GOPROG3	05,2640	183	2 182 183
GETRPSV	11,2534	1302	1 1302	GOESTIMS	33,2116	415	1 415	GOQ	41,3020	338	1 338
GETRVN	35,3413	498	1 497	GOEXTVB	43,2000	229	1 318	GOREDO20	27,2111	383	1 382
GETTF	30,3322	598	6 589 596	GOFLASH	10,2624	1433	42 189 850	GOSHOSUM	43,2751	= 256	1 230
GETUM	23,3110	566	2 569 589	GOFLASHR	10,2763	1436	19 473 848	GOSLEEPS	10,3102	1438	3 1435 1446
GETUNITV	25,2137	799	1 799	GOFLASH2	10,2626	1433	14 1430 1435	GOTO	6615	1095	13 1096 1163
GETVEL	25,2133	799	1 799	GOGOMARK	10,2536	1431		GOTOADDR	E7,1645	= 115	14 115 826
GETX	12,2772	1259	3 1256 1269	GOGOPROG	04,2202	195	1 196	GOTOERS	6631	1095	1 1095

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SYMBOL	DEF	H	REFERENCES
GOTOGE	6644		1096 1 1095
GOTOPOOH	4106		189 71 184 1412
GOTOR21	43,2576		250 1 229
GOTOR23	43,2601		250 1 229
GOTOUPSY	25,3025		815 1 811
GOTOV56	4550		620 2 383 573
GOVNUPDT	40,3222		353 1 322
GOXDSP	10,2461	=	1447
GOXDSPF	10,2465	=	1447 15 233 1466
GOXDSPFR	10,2504	=	1447
GOXDSPR	10,2501	=	1447
GRABANG	21,3362		996 1 993
GRAD	E7,1651	=	115 3 115 822
GROUPKIL	04,2172		195
GRP2PC	27,2712		1297 26 551 1313
GRP2SVQ	E7,1536	=	118 4 118 1297
GRRBKBIT	4706	=	53
GRRBKFLG	0125	=	53 1 253
GSELECT	07,3235		1397 3 1396
GSHIFT	7570		1116 1 1083
GTSCPSS	33,3133		433 1 413
GTSCPSS1	33,2001		413 1 200
GTSFIN	42,2126		264 1 340
GTSFINLC	41,3152		340 1 340
GTSFOUT	42,2120		264 1 327
GTSFOUTL	41,2561		327 1 327
GTSOPND2	E5,1655	=	97
GTSOPTCS	33,3623		442 1 444
GTSOPTSS	33,3624		442
GTSWTLST	E5,1645	=	97
GTSWTLT1	E5,1645	=	97 3 425 428
GUESS	33,2016		414
GUESSBIT	4711	=	46
GUESSW	0034	=	46 4 477 1264
GUESS1	33,2254		417
GWAKE	07,3176		1395 1 1395
GWAKE2	07,3136		1394 1 1395
GYMDIBIT	4712	=	56
GYMDIFSW	0150	=	56
GYROAGRE	07,3150		1394 1 1394
GYROBUSY	07,3171		1395 1 1394
GYROCMD	0047 J	=	36 6 147 1400
GYROCTR	0047 J	=	36
GYREXIT	07,3341		1399 1 1399
GYROFRAC	07,3431		1401 2 1398 1401
GYTOBETG	E5,1472	=	95
GONBYBIT	4703	=	57
G21	E6,1672	=	111
H	E4,1611	=	86 8 86 1314
HACK	20,3471		943 4 921 927
HACKWLST	20,3500		943 1 943
HALF	4675	=	1171 26 415 1472
HALFDP	04,3450	=	1173 1 1303
HALFNFLT	23,2267		288
HALFPR	4674	=	1048 1 1049
HALFREV	04,2651		483 2 483
HALFSAFE	36,2401		545 1 544
HALFY	1075		74 1 74
HALVE	26,3327	=	832 7 808 832
HANG2C	06,2071		130 1 129
HAPO	E4,1763	=	89 5 89 630
HAPOX	E4,1751	=	88 4 88 511
HAVDNRNG	25,3446		822 1 822
HAVEBASE	35,3335		497 1 498
HAVEGLES	11,2002		477 1 676
HAVENCRM	04,3622		1258 1 1258
HCRUPTBB	4062		127 1 127
HDISP	E6,1712	=	112 1 112
HDOT	E7,1736	=	117 2 273 534
HDOTDISP	E6,1714	=	112 1 112
HEADSUP	E6,1726	=	109 6 109 796
HIOPHALF	26,3327	=	31 12 287 1321
HIOP1/4	26,3321	=	31 4 767 1352
HIENERGY	12,3424		1265 1 1265
HIGHGAIN	22,3161		407 1 407
HIGH4	7711		1170 4 128 1095
HIGH9	7713		1170 5 474 1078
HIMINCDN	42,3311		333 1 333
HIND	0143	=	55 3 811 814
HINDBIT	4705	=	56
HIPRIC	10,2650		1433 1 1433
HISCALAR	0003	=	38 2 422 1098
HISECDN	42,3310		333 1 332
HITEMIN	0123	=	66 3 344 345
HITEMOUT	1007	=	72 4 331 334
HIUNITX	26,3327	=	31 4 279 885
HIUNITY	26,3325	=	31 2 279 885
HIUNITZ	26,3323	=	31 4 279 889
HI10	07,3713		1415 1 1414
HI5	4364		371 9 130 1366
HI6ZEROS	26,3331	=	31 31 512 1352
HMSIN	42,3365		344 1 341
HMSOUT	42,3143		331 1 327
HOLDATT	34,3470		584
HOLDFLAG	1332		78 17 391 998
HOLDFUNC	21,3356		996 1 993
HOLDW	E5,1664	=	94 7 94 1225
HORIZ	31,2527		616 1 612
HORIZ.1	31,2565		616 1 619
HORIZ.2	31,2735		618 1 618
HORIZ.3	31,2740		618 1 618
HORIZ.4	31,2744		618 2 618
HORIZ.5	31,2746		618 1 618
HORIZ.6	31,2752		618 1 616
HORIZALT	1354		80 2 616
HORIZON	E5,1752	=	94 5 94 609
HP	E5,1624	=	91 8 91 546
HPE	36,2000		539 1 548
HPER	E4,1765	=	89 3 272 630
HPERMIN	E4,1720	=	88 12 88 548
HPERX	E4,1753	=	88 4 88 512
HPL	36,2002		539 1 548
HPO	E5,1630	=	91 4 91 545
HRCON	42,3451		345 2 344
HRCON1	42,3212		331 1 331
HUNTEST	25,2365		806 4 806 818
HUNTEST1	25,2434		807 1 806
HUNTEST3	25,2553		808 1 813
I	E6,1700	=	102 14 102 954
IAVG	E6,1471		99 2 688
IAVG/TLX	E6,1472		99 1 907
IBNKCALL	4633		1072 42 132 1393
ICDUFAIL	06,2665	=	153 1 154
ICORK2	43,2166		234
IDADDTAB	42,2563		272 2 263
IDADDTEM	0142	=	67
IDAD1TEM	0150		67 4 263 339
IDAD2TEM	0151		67 2 263
IDAD3TEM	0152		67
IDLEBIT	4705	=	46
IDLECADR	43,2732		254 1 254
IDLEFAIL	0030	=	46 3 660 675
IDLEFBIT	4704	=	57

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SYMBOL	DEF	H	REFERENCES	SYMBOL	DEF	H	REFERENCES	SYMBOL	DEF	H	REFERENCES
IDLEFLAG	0161	= 57		IMUFIN20	07,3012	= 1406	2 714 719	INDEXNUM	E4,1733	= 87	3 87 888
IDLEMASK	10,3136	1438	1 1443	IMUGOCD	07,3440	1402		INDEX2	6133	1078	1 1078
IDLERET1	10,3427	1443		IMUMCN	06,2174	134	2 132	INDJUMP	6243	1083	6 1077 1080
IDLESLEP	10,3662	1448	1 1438	IMUOP	06,2604	149	1 154	INDWORK	6153	1078	1 1078
IDOFLMK	E5,1753	= 94	5 94 620	IMUOP2	06,2625	149	1 149	INFINAPO	12,3732	1270	2 1270
IERASTST	6074	1077	1 1077	IMUPULSE	07,3125	1394	6 236 1476	INFINBIT	4704	= 59	
IFAILINH	05,3144	187	1 182	IMUSE	0007	= 43	5 196 1410	INFINFLG	0200	= 59	5 890 1265
IFAILJMP	06,2737	154	1 135	IMUSEBIT	4703	= 44		INFINITY	12,3210	1262	5 1259 1262
IFAILCK	07,3036	1392	1 1391	IMUSEFLG	4703	= 1406	3 138 149	INFLIGHT	23,2000	= 28	1 1319
IFLAGC	13,3053	1284	1 1285	IMUSTALL	07,3516	1405	12 232 719	INHOLD	21,3447	998	1 998
IFLAGP	13,3030	1284	1 1284	IMUSTLLG	33,2316	419	5 414 432	INITA	27,2552	576	1 576
IFLEGAL	10,2707	1434	1 1434	IMUSUPER	30,2000	= 29	1 240	INITB	27,2556	576	1 576
IGC	E5,1761	= 92	4 92 1324	IMUTEST	33,2004	414		INITDSP	10,3165	1439	1 1378
IGNFLAG	0153	= 57		IMUVAR	34,3223	573	2 569 572	INITIALW	27,2544	576	2 569 612
IGNFLBIT	4676	= 57		IMUVARR	30,3651	603	1 594	INITLOC2	17,2213	899	1 897
IGNITION	24,2554	648	2 209 659	IMUZERO	07,2516	1385	2 232 414	INITRLI	25,2354	805	1 804
IGSAMEX	27,2213	386	1 386	IMUZEROA	07,2526	1385	1 1385	INITROLL	25,2260	804	1 796
IMEDIATE	01,3612	1380	4 1379 1382	IMUZEROK	43,2133	232	1 232	INITSUB	04,2315	197	2 189 194
IMMEDRET	10,3515	1445		IMUZERO2	07,2561	1386	1 1385	INITV	12,3510	1267	2 1265 1266
IMODES30	1320	78	63 134 1407	IMUZERO3	07,2570	1386		INITVEL	11,2000	477	3 465 665
IMODES33	1321	78	38 131 1392	IM30INIF	05,3156	188	1 179	INITVELX	11,2251	481	1 481
IMPLBURN	24,2657	650	1 648	IM30INIR	05,3157	188	1 182	INITVEL1	11,2022	477	1 477
IMPULBIT	4702	= 47		IM33INIT	4763	= 188	2 179 182	INITVEL2	11,2056	478	1 480
IMPULCHK	24,2567	648		INBOUND	27,3111	1347	1 1346	INITVEL3	11,2101	478	2 478
IMPULSW	0044	= 47	5 198 680	INCORBIT	4700	= 52		INITVEL4	11,2133	479	1 479
IMU/CPT	E5,1450	= 95		INCORFLG	0117	= 52	9 568 595	INITVEL5	11,2157	479	1 479
IMUACK	21,2576	983	1 983	INCORPEX	E4,1642	= 86	4 1203 1206	INITVEL6	11,2221	480	1 480
IMUATTCK	43,2416	242	1 229	INCORP1	36,3250	1219	3 570 615	INITVEL7	11,2224	480	1 479
IMUBACK	33,2033	414		INCORP2	36,3460	1223	3 571 615	INITZOPT	06,3216	159	3 157 158
IMUBAD	07,3441	1402	5 138 1402	INCOR1	36,3304	1220	1 1220	INLINK	0045	= 36	2 187 1414
IMUCADR	1322	= 78	3 187 1402	INCOR1A	36,3313	1220	1 1220	INLUNCHK	11,3201	1308	1 1309
IMUCAGE	06,2555	147	1 154	INCOR1B	36,3342	1220	1 1220	INREL	0137	= 67	23 310 315
IMUCAL	33,2000	= 30	6 414 444	INCOR1C	36,3350	1220	2 1220	INRELTAB	40,2231	311	2 311 314
IMUCAL1	04,2000	= 25	1 442	INCOR2	36,3407	1221	1 1221	INRLBIT	4706	= 56	
IMUCAL2	06,2000	= 26		INCOR2AB	36,3437	1222	1 1222	INRLSW	0144	= 56	2 804 805
IMUCAL3	32,2000	= 30	1 421	INCOR3	36,3443	1222	1 1222	INROLOUT	25,2343	805	3 804 805
IMUCOARK	43,2157	233	1 233	INCR	01,2433	1160	1 1084	INT/W	13,3545	1293	2 1292
IMUCOARS	07,2602	1387	5 234 719	INCRCOUS	22,3607	1475		INTBANK	13,3021	1283	1 1283
IMUCOARV	43,2200	234	2 234 235	INCRDCOU	22,3060	405	2 406 407	INTBITAB	13,3467	1291	2 1290
IMUCOMP	06,2000	= 26	1 290	INCRSVG	20,2013	675	1 673	INTBIT15	0115	66	7 66 1078
IMUFAIL	06,2665	= 153	1 154	INDEP	E7,1774	= 123	4 1252 1253	INTB15+	0114	66	3 66
IMUFINE	07,3012	1391	3 236 1406	INDERASE	6155	1078	1 1078	INTEGRV	13,3113	1286	13 203 1295
IMUFINED	07,3034	1391	2 1391 1396	INDEX	6115	1078	1 1076	INTEGRVS	13,3066	1285	6 469 866
IMUFINEK	43,2244	236	1 229	INDEXI	23,3671	1335	1 1334	INTEGRV1	13,3115	1286	2 1284
IMUFINEV	43,2274	236	1 236	INDEXLOC	0130	= 66	12 1078 1161	INTEGRV2	13,3120	1286	1 1314

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INTERCEP	16,3725		957 1 950	INVC120	32,2477		856 1 856	ITSAJOB2	01,3740		1383 1 1381
INTERP	36,2360		544 2 544 545	INVC125	32,2503		856 1 856	ITSATBL	01,3643		1380 1 1378
INTEXIT	13,3204		1287 3 1288 1289	INVRSEQN	12,3132		1261 1 1261	ITSAVAR	01,3543		1378 1 1378
INTFLAG	0227	=	62	IOGARATE	E6,1701	=	102 3 102 950	ITSAWAIT	01,3562		1379 1 1379
INTFLBIT	4675	=	62 2 182 1290	IRETURN	E4,1614	=	86 8 86 1287	ITSEVEN	01,3744		1383 1 1380
INTGRATE	11,3236		1309 2 1309	IRETURN1	1127		75 6 75 1296	ITSINDIR	5367		1379 1 1379
INTIME	E7,1502	=	120 8 120 543	IRIGCOMP	06,3331		292	ITSLGCL1	5376		1381 2 1381 1382
INTINIT	13,2000	=	27 3 202 1292	IRIGX	06,3333		292	ITSLGCL2	01,3701		1382 1 1382
INTINT	35,2706		469 2 465 467	IRIGY	06,3347		292	ITSLIKE8	01,3614		1380 1 1378
INTLOOP	35,2032		453 1 454	IRIGZ	06,3363		292	ITSLNGCL	01,3726		1382 1 1378
INTMASK	05,3151		188 1 183	IRIG1	06,3407		294 2 290 294	ITSNOVAC	01,3637		1380 1 1380
INTMCTBS	41,2116		318 2 317	ISCADR+0	4234		365 2 365 374	ITSWBIT	4675	=	57
INTOTHIS	13,2122		501	ISITNOO	10,3303		1441 1 1441	ITSWICH	0152	=	57 7 453 544
INTPRET	6006		1074 246 194 1467	ISITPCO	04,2061		193 1 192	ITSWTLST	01,3733		1382 1 1381
INTPRET1	26,2000	=	29 1 1172	ISITPRIO	10,3366		1442 2 1443	ITURNON	06,2526		145 1 154
INTPRET2	04,2000	=	25 1 1173	ISLIST+0	4240		365 2 365 374	ITURNON2	06,2551		146 2 145 149
INTRPVP	04,3410		520 2 517	ISSERVCN	04,2112		194 1 193	IXX	E6,1470		99 4 687 911
INTRSM	6017		1074 1 1182	ISSUP	06,2323		138	==========			
INTSTALL	13,3371		1289 32 194 1467	ISSWOFF	06,2700		152	J/M	E6,1623	=	106 3 106 1003
INTTEMP	E6,1506		100 2 100 105	ISSWON	06,2710		152 1 152	J/M1	E6,1624	=	106 2 106 688
INTVAL	33,3121		433 2 425 429	ISSZERO	06,2354		139 1 147	J/M2	E6,1625	=	106 2 106 688
INTVALUE	05,3303		912 1 910	ISWCALL	4637		1072 1 916	JAMIT	07,2402		226 1 226
INTVAR	E4,1777	=	89 2 89 570	ISWRETRN	4646		1072	JAMPROC	4257		366
INTVEC	E5,1476	=	96	IT	E5,1610	=	91 3 91 542	JAMTERM	4245		365 1 1442
INTVEC1	E5,1476	=	97 3 435	ITCTR	E7,1504	=	120 4 477 480	JCAXIS	31,3055		620 1 610
INTVEL	11,2000	=	26 1 477	ITEMP1	0061		65 42 65 1458	JCOUNT	0002	=	891 1 887
INTWAKE	13,3406		1290 4 258 1287	ITEMP2	0062		65 22 65 1451	JETACTN	15,3654		1055 2 1055 1056
INTWAKEC	27,2664		1297 1 1297	ITEMP3	0063		65 7 65 1450	JETADDR	21,3747		1004 1 1004
INTWAKEM	27,2661		1297 1 1296	ITEMP4	0064		65 8 65 1401	JETAG	E6,1711	=	108 10 108 1056
INTWAKEU	27,2633		1296 1 1470	ITEMP5	0065		65 2 65 1375	JETCALL	15,3662		1056 1 1055
INTWAKEX	27,2676		1297 1 1297	ITEMP6	0066		65 3 153 1375	JETCALL1	15,3622		1055 1 1055
INTWAKEO	13,3404		1290 2 633 1297	ITERATOR	12,2543		1252 1 1265	JETCALL2	15,3645		1055 3 1055
INTWAKE1	13,3426		1290 3 502 1290	ITERCTR	0026	=	1273 4 1243 1263	JETCALL3	15,3631		1055 1 1056
INTWAKLM	27,2674		1297 1 1297	ITISMASK	10,3414		1443 1 1442	JETEM	E6,1720	=	109 28 109 1046
INTWAKUP	27,2700		1297 1 1296	ITISMCOM	37,3314		786 1 786	JETEM2	E6,1624	=	110 3 1043
INTWAKUQ	0330	=	1296 3 1296 1297	ITRO	6337		1086	JETROLL	16,3630		954 2 954
INTWAK1Q	0330	=	69 1 1296	ITR1	6326		1086	JETS	21,3425		998 4 987 996
INTY	E5,1500	=	96 6 430 431	ITR10	6111		1077	JETSLECT	17,2601		1007 1 1004
INTYBIT	4707	=	49	ITR11	6151		1078	JJ	E7,1771	=	116 8 821 822
INTYPFLG	0070	=	49 17 469 1295	ITR12	6103		1077	JLOOP	21,3431		998 1 1003
INTZ	E5,1504	=	96	ITR13	6162		1079 1 1078	JLOOPCNT	E4,1724	=	87 6 87 887
INVC100	32,2423		855 1 842	ITR14	6206		1080	JLOOPP	31,3315		887 1 888
INVC107	32,2443		856	ITR15	6072		1077	JN	21,3641		1001 5 1000 1001
INVC109	32,2446		856 1 856	ITR7	6230		1081	JNDX	E6,1617	=	109 9 109 1054
INVC115	32,2473		856 1 856	ITSAJOB	01,3627		1380 1 1379	JNDX1	E6,1620	=	109 6 110 1055

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JOBSLEEP	5C70		1177 8 365 1452	KALCMCN1	22,2000	=	28 4 390 405	KMJ1	E6,1621	=	106 2 106 688
JOBSLP1	01,3017		1182 1 1177	KALCMCN2	22,2000	=	28 1 396	KMJ2	E6,1622	=	106 2 106 688
JOBSLP2	01,3030		1182 1 1184	KALEBCCN	07,3571		1406 1 1406	KMPAC	E6,1510	=	105 38 105 1027
JOBWAKE	5C74		1177 13 368 1453	KALUPDT	21,3132		989 1 984	KMPTEMP	E6,1512	=	105 3 105 967
JOBWAKE2	01,3044		1183 1 1177	KASCALE	26,3231		831 1 799	KNOWNBIT	4703	=	55
JOBWAKE3	01,3056		1183 2 1183	KAT	E7,1717	=	116 3 116 805	KNOWNFLG	0141	=	55 6 55 589
JOBWAKE4	01,3050		1183 1 1183	KATEST	25,2346		805 1 805	KPDN	4727	=	938 3 922 938
JOBXCHS	10,3122		1438 2 1433 1434	KA2	26,3305		832 1 804	KPGEN3	E6,1651	=	103 3 103 961
JP	21,3650		1001 6 1000 1001	KA3	26,3307		832 1 804	KPIP	37,3353		787
JSWCHBIT	4675	=	43	KA4	26,3311		832 2 804 832	KPIP1	37,3355		787 2 779 787
JSWITCH	0001	=	43 5 1309 1314	KBIT	4712	=	44	KPRINEDT	E6,1644	=	102 6 102 904
JTAGTIME	37,3142		781 1 776	KCCUNT	0005	=	891 1 887	KRESUME1	21,2403		977 1 972
JTIME	21,3713		1003 4 1000 1001	KC3	26,3255		832 1 811	KRESUME2	21,3141		990
JUNCTN1	04,3200		516 1 516	KDPNDX	E6,1665	=	111 4 111 406	KR1	26,3007		761 1 760
JUNCTN2	04,3233		517 1 517	KEEPPRIO	10,2672		1434 2 1440 1444	KR2	26,3013		761 1 760
JUNCT1	36,2347		544 1 545	KEP	25,3305		820 1 815	KR3	26,3015		761 1 760
JUNCT2	36,2353		544 3 545	KEPCONVG	12,2334		1247 3 1245 1246	KR4	26,3023		762 1 760
JUNCT3	36,2244		543 1 543	KEPC1	0042	=	1272 3 1243 1260	KSPNDX	E6,1664	=	111 7 111 406
JZERO	E6,1744	=	103 5 922	KEPC2	0044	=	1272 3 1243 1260	KT	E4,1763	=	88 10 88 519
JZSTORE	20,2427		922	KEPLERN	12,2000		1243 2 1299	KTETA	26,3233		831 1 802
J1	E6,1553	=	101 3 101 925	KEPLOCP	12,2151		1245 1 1246	KTETA1	26,3001		761 1 767
J1TMP	E6,1726	=	103 7 103 935	KEPPREP	11,2310		1298 3 1287 1304	KTLX/I	E6,1646	=	102 5 102 907
J18	21,3614		1000 2 999 1001	KEPRTN	E4,1670	=	86 3 1247 1299	KTRCS	4675	=	1059 1 1051
J2	E6,1555	=	101 3 101 925	KEPZERO	04,3452	=	1255 4 1243 1269	KT1	26,3235		831 1 802
J2REQSQ	13,3746		1318 1 1306	KEP2	25,3311		820 2 804 820	KVSCALE	26,3227		831 1 799
J2TMP	E6,1730	=	103 7 103 936	KEYCALL	07,2140		219	KV1	E6,1666	=	111 3 111
J20	21,3620		1000 1 999	KEYCOM	07,3622		1413 1 219	KV2	E6,1674	=	111
J21	21,3631		1000 1 999	KEYRPTBB	4056		127 2 126 127	KV3	E6,1702	=	111
J22	21,3657		1001 5 999 1000	KEYRUPT	07,2000	=	26 1 1413	KWE	26,3243		831 1 833
J23	21,3670		1001 7 999 1000	KEYRUPT1	07,3613		1413 2 126 127	KYDN	4727	=	938 2 928
J24	21,3702		1001 2 1000	KEYTEMP1	0073	=	65 6 127 1414	KYGEN3	E6,1651	=	103 2 964
J3	E6,1557	=	101 3 101 925	KEYTEMP2	0734	=	71 2 1414	K1D	26,3223		831 1 818
J3TMP	E6,1732	=	103 7 103 936	KFLAG	0016	=	44 9 540 548	K1K2LOOP	32,2131		634 1 634
J4	E6,1561	=	101 4 101 925	KILCLOCK	35,3050		471 2 471 472	K1RTE	35,3757		882 1 842
J4REQ/J3	13,3736		1318 2 1306	KILLGRP4	26,2505		751 1 818	K1VAL	17,2012		680 1 679
J4TMP	E6,1734	=	103 7 103 936	KILLJETS	16,3716		956	K2CALC	32,2127		634 1 634
J5	E6,1563	=	101 4 101 925	KILLMCN	41,3304		348 2 348	K2D	26,3225		831 2 818 819
J5TMP	E6,1736	=	103 8 103 937	KILL2C	04,2225		196 1 196	K2ROLL	E7,1643	=	115 7 115 824
J6.	21,3502		998 1 998	KILMONCN	4220		364 4 356 378	K2RTE	35,3761		882 1 842
J6TMP	E6,1740	=	103 6 103 937	KLAT	E7,1631	=	115 3 115 824	K2VAL	17,2014		680 1 680
J7	21,3526		999 1 999	KLEENEX	10,2464		1430 3 225 699	K3RTE	35,3763		882 1 842
J8	21,3535		999 1 999	KLOOP	31,3307		887 1 888	K3S1	22,2371		396
==========	==========		==========	KLOOPCNT	E4,1725	=	87 4 87 888	K3VAL	17,2016		681 1 680
KACOS	26,3245		831 1 803	KMATRIX	21,2334		974 2 971 972	K4	22,2372		396
KALCMAN3	22,2000		390 1 1406	KMJ	E6,1620	=	106 3 106 974	K4RTE	35,3765		883 1 842

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SYMBOL	DEF	H	REFERENCES	SYMBOL	DEF	H	REFERENCES	SYMBOL	DEF	H	REFERENCES
K4SG	22,2373		396	LCHAN	0001	= 38	17 131 1466	LIMITCOM	42,3247		332 1 332
==========				LCX/360	E6,1614	= 109	18 109 1052	LIMITL/D	25,3521		824 8 804 823
L	0001	= 36	252 38 1473	LDANZIG	00,3712	1157	1 1156	LIMITS	4673	= 1167	7 839 1475
L/D	E7,1633	= 115	13 115 826	LDATALST	0334	70	1 1066	LIMVEL	36,2020		540 1 545
L/DCALC	E7,1726	= 116	1 801	LDLOOP72	27,3627	1469	1 1470	LINUS	5415	= 1448	2 382 658
L/DCMINR	E7,1627	= 115	4 115 826	LDNDUMP	05,3543	1068	1 1068	LINUSCHR	10,3522	1445	2 1433 1434
L/D1	E7,1635	= 115	5 115 826	LDNDUMP1	43,2713	253	1 253	LITTLSUB	33,3723	445	2 441 442
LAD	E7,1623	= 115	17 115 824	LDNDUMP1	05,3544	1068	1 1068	LLASRD	30,3336	599	2 597 695
LADPAD	E6,1407	98	1 795	LDNPHAS1	05,3145	187	1 184	LLASRDA	30,3345	599	3 556 695
LALOTORV	13,2373	1205	7 526 797	LDNPHAS2	05,3463	1065	1 1063	LMCRATE	16,3724	957	2 951 952
LAMBERT	12,3215	1263	1 479	LDPOSMAX	04,3463	= 1271	1 1270	LMKLMCOM	13,2234	727	1 727
LAMBLOOP	12,3332	1264	3 1265 1267	LEFT	00,2342	1128	1 1125	LMKLOOP	31,3345	887	1 887
LAMENTER	12,2706	1254	1 1267	LEFT-	00,2336	1128	1 1125	LMK52	13,2224	727	1 727
LAMPTEST	06,2750	154	2 143 144	LEFTNCOM	40,3061	343	1 343	LMOONBIT	4700	= 59	
LANDALT	E4,1761	= 88	4 88 599	LEFT5	4345	370	5 324 1366	LMOONFLG	0174	= 59	5 32 1282
LANDBANK	43,3173	260	1 260	LEGALTST	40,2430	314	2 314	LMPOS	34,3133	572	2 568 571
LANDLAT	1103	= 75	1 275	LEMCONIC	13,3057	1284	4 540 727	LMTOCM	43,3105	258	1 258
LANDLONG	E4,1757	= 88	4 88 599	LEMMASS	E6,1473	99	6 99 911	LMTOCMSV	43,3100	258	1 229
LANDMARK	E5,1751	= 94	24 94 888	LEMNO	05,3204	910		LNDMKSEL	31,3215	886	1 256
LARGE	00,3065	1142	1 1142	LEMONM	0056	= 37		LNG(SPL)	E7,1402	= 114	5 114 854
LARGE2	00,3112	1144	2 1142 1143	LEMPOS	1214	= 77	5 77 603	LNGCALL2	01,3461	1201	1 1201
LARGE3	00,3074	1144	1 1142	LEMPREC	13,3036	1284	3 32 521	LNLMKEND	31,3101	620	1 620
LARMENT	5551	1457		LEMSTORE	22,3372	488	2 488 540	LOADCOUD	22,3301	410	1 391
LASINEX	00,3630	1156	1 1156	LEMTEST	05,3200	910		LOADDAP	24,2000	= 28	
LASTBIAS	06,3636	299	1 773	LEMVEC	43,2702	253	1 230	LOADITIS	10,3607	1446	1 1443
LASTGTS	33,3270	436		LEMYES	05,3207	910	1 910	LOADLV	41,2771	337	10 316 345
LASTMASP	E6,1522	= 100	1 100	LEM52	13,2214	727	1 727	LOADLV1	41,2001	316	1 237
LASTSEG	07,3332	1399	1 1399	LENGTHOT	E5,1412	95	14 414 437	LOADSTAT	1014	73	4 337 368
LASTTIME	01,3500	1201		LEQ	E7,1653	= 115	7 115 823	LOADSTDT	33,2564	427	2 428 429
LASTXCMD	0039	= 78		LESCHK	05,3146	187	1 187	LOADTIME	22,3505	1472	30 421 1295
LASTYCMD	0035	= 78		LEWD	E7,1724	= 115	11 806 817	LOADYZ	22,3303	410	1 409
LAT	1103	= 75	17 75 1205	LEWDOVFL	25,2733	812	1 812	LOC	0164	69	43 368 1447
LAT(SPL)	E7,1400	114	11 114 854	LEWDPTR	25,2737	812	1 812	LOCCTR	0064	= 65	31 368 1442
LAT-LONG	13,2322	1203	9 449 891	LEWD1	26,3147	830	1 814	LOCSAM	14,2216	= 701	2 693 734
LATANG	E7,1675	= 116	7 116 824	LFTFLGCN	43,2714	253	1 229	LOCSKIRT	22,2736	= 403	7 391 394
LATAZCHK	04,2617	443	1 414	LGCL2ADR	01,3764	1383	1 1382	LOCTHETA	22,3622	1475	1 1475
LATBIAS	26,3241	831	1 824	LGCL2CDR	5241	1201	1 1201	LOD	E7,1625	= 115	3 115 823
LATITUDE	E5,1402	95	6 414 526	LGCOMP	06,3516	296	2 290 296	LODMIXNN	42,2100	263	1 263
LATLONG	13,2000	= 27	1 1203	LGWAKE	07,3206	1395	2 1395 1396	LODNLV	42,2116	263	1 263
LATSLOPE	26,3144	= 832	1 795	LGYRO	1304	77	10 187 1399	LODNNLOC	41,2113	318	8 317 337
LATSW	0145	= 56	1 817	LGYROBIN	43,2272	236	1 236	LODNNTAB	42,2062	263	1 318
LATSWBIT	4707	= 56		LIFTTEMP	1265	= 77	5 77 528	LODPAD	E6,1410	98	1 795
LATTAB	31,3540	892	3 556 887	LIGHTCN	27,2461	575	1 575	LODPHALF	04,3450	= 31	2 673 1269
LAUNCHAZ	E5,1633	= 96	8 168 532	LIGHTSET	05,2725	184	2 181 183	LODPMAX	04,3463	1173	2 493 1271
LBUF2	00,2470	1131	2 1155 1157	LIM(-22)	27,3321	1352	1 1347	LODPMAX1	04,3465	1173	

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SYMBOL	DEF	H	REFERENCES	SYMBOL	DEF	H	REFERENCES	SYMBOL	DEF	H	REFERENCES
LODP1/4	04,3476	= 31	1 1207	LOW5	4362	371	14 226 1414	M/SLIMIT	42,3241	332	2 332
LODSAMPT	4414	372	3 348 1414	LOW7	6043	1075	14 193 1446	M/SNORM	42,3255	332	7 332 333
LOENERGY	12,3444	1266	1 1265	LOW7+2K	4750	1169	1 1081	M/SOUT	42,3216	332	1 327
LOG	23,2155	284	1 810	LOW8	4373	371	18 370 1469	MAGVEC2	E5,1721	= 93	6 93 1267
LOLIM	12,3505	1267	2 1264	LOW9	4741	1168	7 222 1185	MAGVTPI	E5,1634	= 91	2 91 543
LOMAT	35,2667	469	3 465 629	LOGZEROS	04,3452	= 31	5 663 1255	MAINRTNE	04,3237	517	1 520
LONG	1105	= 75	12 75 1205	LREGCHK	04,3070	493	1 492	MAINRTN1	04,3263	518	1 517
LONGBASE	1135	75	2 1376 1382	LRGROVO	36,2424	545	1 545	MAJ+	07,3271	1398	1 1397
LONGCADR	1133	75	2 1201 1202	LRUPT	0011	= 36		MAJ-	07,3411	1401	1 1397
LONGCALL	5231	1200	4 415 1383	LSDISP	16,2533	695	1 695	MAKECADR	4604	1071	7 381 1452
LONGCLCL	01,3721	1382	2 1382	LSLONG	E4,1752	= 87	2 886	MAKEGEN	10,3665	1448	1 1436
LONGCYCL	01,3465	1201	1 1202	LSPOS	26,2110	737	3 701 1308	MAKEMARK	10,2515	1430	1 1434
LONGEXIT	E3,1434	81	3 1201 1202	LSTBNKCH	43,3720	1367	1 1366	MAKEPLAY	10,2674	1434	3 1433 1448
LONGGYRO	07,3345	1399	1 1398	LSTIME	26,2126	738	3 737 738	MAKEPRIO	10,2640	1433	1 1434
LONGRTRN	01,3505	1201	1 1202	LSTPTR	0144	= 67		MAKESERV	37,2752	776	1 777
LONGSAVE	E4,1734	= 87	3 87 889	LST1	E3,1400	81	48 127 1378	MAMAX1	E7,1651	= 124	3 124 869
LONGTAB	31,3622	893	3 556 887	LST2	E3,1410	81	36 185 1198	MAMAX2	E7,1653	= 124	3 124 869
LONGTIME	1137	75	11 1200 1382	LST2CON	41,2145	318	1 318	MANROT	21,3022	987	3 985 993
LOONE	34,3602	586	1 584	LST2FAN	43,2002	229	2 229 376	MANTABLE	21,3024	987	2 986 987
LOOPSET	32,2124	634	4 633 634	LTHVACA	05,3150	188	4 186	MANTCCSC	06,3112	157	3 156 157
LOOPSIN	22,2414	396	1 396	LUNABIT	4677	= 49		MANTCMAN	06,3107	157	1 157
LOOP1	23,3624	1334	1 1334	LUNAFLAG	0060	= 49	27 448 1209	MANUCALL	22,3216	407	1 407
LOOP2	23,3623	1334	1 1334	LUNCHAZ1	E5,1633	= 97	5 97 434	MANUDES	06,3077	157	1 155
LOOSE	33,2773	431	1 431	LUNENT	26,2774	761	1 759	MANUEXIS	34,3454	584	2 581 582
LOPC	30,2000	= 29		LUNLMKLD	31,3064	620	1 612	MANUEXIT	34,3455	584	
LOSCALAR	0004	= 38	3 422	LUNPOS	26,2115	737	2 884 1309	MANUOFF	22,3133	406	1 406
LOSVEC	E5,1413	95	5 95 442	LUNSPH	11,3263	1309	1 1308	MANUSTAL	22,3110	406	
LOS1	E5,1454	= 95		LUNVEL	26,2120	738	1 1310	MANUSTAT	22,3142	406	1 405
LOS2	E5,1462	= 95		LV	0044	= 37	2 1142 1144	MANUSTOP	22,3232	409	1 406
LOTEMIN	0124	= 66		LVBUF	6242	1082	1 1106	MANUVER	27,2000	= 29	2 381 388
LOTEMOUT	1010	= 72	1 334	LVSQUARE	0042	= 37	2 1142 1147	MANUVER1	27,2000	= 29	1 387
LOTHRUST	20,2021	675	1 673	LVWTLIST	5152	1190	1 1194	MANYFEET	36,2016	540	1 542
LOUNITX	04,3450	= 31		LWOSTORE	25,2700	812	1 812	MARKCONT	07,2152	221	1 227
LOUNITY	04,3446	= 31		LXA	01,2401	1159	1 1084	MARKCOP	10,2544	1431	1 1431
LOUNITZ	04,3444	= 32		LXC	01,2405	1159	1 1084	MARKCTR	1126	= 75	1 502
LOW1DCOD	05,2000	165	1 1069	L14/OUT	40,2615	329	1 329	MARKDATA	1242	= 77	7 77 611
LOWLOAD	10,3654	1447	1 1443	L350	25,3533	824		MARKDIF	10,2203	227	1 227
LOWMEMRY	14,2000	620	1 609	L353	25,3546	824	1 824	MARKDISP	37,2405	559	1 221
LOWSUPER	30,2000	= 29	4 32 691	L355	25,3561	824	4 824 826	MARKDOWN	E7,1674	= 122	9 32 722
LOWVERB	41,2034	317	1 317	L357	25,3624	826	1 824	MARKEBAN	1070	74	1 1447
LOW10	4747	1168	20 32 1365	==========				MARKEND	10,2457	1429	1 1429
LOW11	4372	371	7 129 1086	M.6RTE	34,3710	881	1 861	MARKET	07,2167	221	1 221
LOW2	6214	= 1171	1 1125	M/SCON1	42,3312	333	1 332	MARKET3	07,2216	221	2 221
LOW3	4716	= 1171	3 197 1122	M/SCON2	42,3313	333	1 332	MARKFLAG	1070	= 1447	1 1431
LOW4	4721	1168	4 830 1450	M/SCON3	42,3315	333	4 332	MARKFMSK	10,3157	1439	2 1430

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MARKFCRM	10,2471		1430	MAXOUT	42,2020		246 1 247	MIDDGIM	04,2000	=	25 1 483
MARKINDX	0301	=	69 7 69 723	MAXPHI	32,2163		634 2 634	MIDFLAG	0002	=	43 5 1288 1316
MARKIT	07,2427		226 1 219	MAXPHIC	32,2166		634 1 634	MIDFLBIT	4676	=	43
MARKIT1	07,2156		221	MAXPLS	10,2201		164 2 163	MIDGIM	04,2653		483 3 631 665
MARKNV	0370		71 5 1431 1440	MAXPLS1	10,2202		164 2 163	MIDGIM1	04,2673		483 1 483
MARKOCT	10,3660		1448 1 1438	MAXRA	27,3022		1343 2 1343	MIDTOAV1	13,3574		1294 1 639
MARKOK	07,2015		216 1 216	MAXRNG	25,3764		830 1 822	MIDTOAV2	13,3570		1294 2 644 755
MARKOVER	10,3547		1445 1 1429	MAXTEST	00,2565		1133 4 1132 1146	MID1FBIT	4710	=	61
MARKPERF	10,2571		1432 1 1441	MAXTFF	27,3212		1349 1 1348	MID1FLAG	0223	=	61 4 1294 1296
MARKPLAY	10,2530		1431 4 1431 1447	MAXTFF1	27,3211		1349 1 1346	MID2	13,3667		1295 1 1295
MARKRET	10,3541		1445 1 1444	MAXTFIRE	16,3567		953 1 953	MID5	4363		371 1 338
MARKRUPT	07,2103		218 2 126 127	MAXTST	16,3573		953	MID7	4160		349 4 349 1447
MARKSTAT	1330		78 43 187 733	MAXVTEST	15,3410		1051 1 1051	MIN	0010	=	1273 4 1252 1253
MARKTIME	1224	=	77 10 77 612	MAXVTIM1	15,3427		1051 1 1051	MIN+	07,3266		1398 1 1397
MARKWAKE	10,3151		1439 1 1446	MAXVTIM2	15,3445		1052	MIN-	07,3406		1401 1 1397
MARK2	07,2224		222 1 221	MAX25C	35,3135		475 1 459	MINANG	22,2366		396 1 391
MARK2CWN	E7,1502	=	114 2 168 722	MBDYTCTL	34,3560		585 2 535 583	MINB12	7710	=	1066 1 1064
MARK2PAC	1C72		74 2 1439 1440	MCDUYDOT	E6,1657	=	102 4 102 927	MINB1314	05,3403		1064 1 1064
MARK3MSK	10,3633		1447 2 1430	MCDUZDOT	E6,1660	=	102 4 102 927	MINCHECK	12,2576		1252 1 1252
MARK4MSK	10,3634		1447 1 1430	MCOS22.5	34,3745		882 1 847	MINCOGA	12,3322		1264 1 1267
MARSDP	35,3720		627 1 627	MCOS7.5	34,3741		882 1 847	MINCON	42,3453		345 1 344
MARSLEEP	10,3602		1446 1 1431	MDOTFAIL	37,3144		781	MINCON1	42,3210		331 1 334
MASKREG	E5,1544	=	96	MDOTHI	24,2361		643 2 651 846	MINCON2	42,3206		331 2 331
MASS	E6,1475	=	99	MDOTLC	17,2030		681 2 680 897	MINDB	24,2210		640 1 640
MASSBACK	24,2752		651	MDOTRCS	34,3732		882 1 846	MINDEX	0774		72 4 194 197
MASSPROP	05,3176		910 5 193 910	MDT	E6,1636	=	101 1 102	MINIRECT	11,3360		1311 2 501 1293
MASSTMP	E6,1662	=	102 11 102 902	MD1	4376		371 3 368 1466	MINLIM	16,3726		957 1 950
MATINC	0140		67 8 67 1111	MEASINC	36,2000	=	30 1 1219	MINLIMAP	16,3507		952
MATMOVE	14,3045		714 3 714 725	MEASINC1	36,2000	=	30 1 1223	MINPERE	23,2461		506 3 505 762
MATRXJOB	34,2127		526 2 206 422	MERRORX	E6,1541	=	105 5 105 987	MINPERM	23,2457		506 1 508
MAT1B1	34,3556		585	MERRORY	E6,1543	=	105 1 105	MINTAU	21,3302		994 3 993
MAX	0016	=	1273 4 1252 1253	MERRORZ	E6,1545	=	105 1 105	MINTIME2	05,3350		1063 1 1064
MAXANG	22,2367		396 1 391	MERUPCAT	21,3001		987 1 986	MINTST	16,3566		953
MAXCHECK	12,2632		1253 1 1253	METHOD1	22,2234		393 1 393	MINUS1	7716	=	1171 2 1398 1445
MAXCHK	23,2754		512 6 511 630	METHOD2	22,2210		393	MINUS2	7715	=	1383 3 185 1378
MAXCOGA	12,3304		1264 2 1263 1264	METHOD3	22,2260		393 2 393	MIS	E6,1720	=	111 17 111 405
MAXDB	24,2211		640 1 640	MFI	E7,1425	=	118 12 390 392	MISCJUMP	6303		1084 1 1081
MAXDBBIT	4677	=	60	MFISYM	E6,1666	=	111 12 392 394	MIXAD	41,2260		320 1 320
MAXDBFLG	0212	=	60 2 246 247	MFS	E7,1425	=	118 5 118 390	MIXBR	0140	=	67 12 263 343
MAXDT	13,3316		1289 2 1288	MGC	E5,1763	=	92 4 92 1323	MIXCON	4726	=	263 1 263
MAXDV	CC,2642		1137 1 1133	MGLVFBIT	4711	=	54	MIXNN1	41,2234		320 1 320
MAXDVSW	0140	=	67 6 1129 1144	MGLVFLAG	0130	=	54 2 483	MIXNN2	41,2246		320 1 320
MAXIN	42,2054		247 1 246	MG2	07,3526		1405 1 1405	MIXNOUN	41,2221		320 1 317
MAXLIM	16,3730		957 2 950 952	MIDAVBIT	4711	=	62	MIXTEMP	0125	=	66 3 314 320
MAXNM	23,2763		512 3 512	MIDAVFLG	0224	=	62 3 1295 1313	MKABORT	07,2013		216 1 215

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MKACPT	10,2216		227 1 227	MONITCR	41,3220		347 7 318 319	MRKRTMP	E6,1445	=	99 4 638 683
MKBUFAD	34,3220		573 1 567	MONIT1	41,3222		347	MRUPTBIT	4706	=	51
MKCDUS	0360		70 2 218 222	MONIT2	41,3235		347 2 347	MRUPTFLG	0106	=	51
MKCDUT	0362		70 2 218 222	MONREF	41,3337		349 1 349	MSGSCAN1	32,2000	=	30
MKCDUX	0363		70 3 218 227	MONREG	41,3265		348 2 348	MSIN7.5	34,3743		882 1 847
MKCDUY	0357		70 3 218 227	MONSAVE	1020		73 7 187 349	MSTORE1	01,2414		1159 2 1160 1163
MKCDUZ	0361		70 3 218 227	MONSAVE1	1021		73 12 187 375	MU(P)	0032	=	1318
MKDNCDR	14,3325		722 1 722	MONSAVE2	1022		73 4 347 362	MUCHTIME	01,3510		1202 2 1201
MKNDX	0354		70 3 227	MOONBIT	4677	=	43	MUEARTH	13,3732		1318 9 478 1318
MKOVBIT	4710	=	52	MOONCASE	16,2342		677 1 677	MULTEXIT	5574		1458 3 1457 1458
MKOVFLAG	0110	=	52	MOONCNTR	14,2256		701 1 701	MULTFAIL	5600		1458 1 1457
MKREJECT	07,2300		223 1 219	MOONFLAG	0003	=	43 29 469 1316	MUM	13,3730	=	1318
MKRELEAS	07,2063		217 8 418 720	MOONGCN	23,2617		508 1 508	MUTABLE	04,3625		1271 7 484 1263
MKRLEES	07,2070		217 1 552	MOONMX	26,3416		1213 2 1210 1212	MWAITBIT	4700	=	51
MKRUPTBB	4057		127 1 126	MOONOTH	0174	=	32 3 257 258	MWAITFLG	0100	=	50
MKT2T1	0355		70 6 218 222	MOONPAD	23,2467		506 1 506	MXM3	22,2304		395 4 385 405
MKVACFND	07,2031		216 5 216	MOONTHIS	0173	=	32 9 258 1292	MXV	7303		1110 1 1083
MKVB5X	07,2415		226 1 225	MORERCLL	16,3553		953 1 953	MYSUBS	21,2000	=	28 1 967
MKVB5Q	07,2421		226 1 222	MORNUM	40,2213		311 2 310	M14ARTE	34,3702		881 1 875
MKVB5I	07,2346		225 4 216 226	MOVATHIS	13,2651	=	32 1 1293	M15RTE	34,3704		881 1 858
MM	E7,1650	=	115 7 115 822	MOVEACSM	13,2651		1281 4 32 1281	M6RTEB28	34,3714		881
MMADREF	41,2033		316 1 316	MOVEALEM	13,2724		1282 3 1226 1282	M8RTEB28	34,3722		881 1 844
MMATRIX	0024	=	1218 8 1210 1305	MOVEPCSM	13,2700		1281 3 1227 1281	M9RTEB28	34,3720		881 2 842 870
MMCHANG	41,3420		357 2 316 319	MOVEPLEM	13,2745		1282 3 1226 1282	==========			
MMDSPLAY	5247		1368 1 183	MPAC	0154		69 781 183 1479	N	E6,1666	=	102 5 102 944
MMNUMBER	0775		72 9 192 196	MPAC+	00,2437		1131 2 1130	NAVKEYIN	0016	=	38 5 184 219
MMTEMP	1060	=	198 3 197	MPAC+6	0162	=	329 7 330 372	NBDONLY	06,3542		297 1 1192
MNKEYIN	0015	=	38 2 184 1413	MPAC-	00,2433		1130 2 1130	NBDX	E3,1460		81 7 81 1192
MODABORT	07,3541		1405 2 1405	MPACSHR	00,2033		1119 2 1127 1148	NBDY	E3,1461		81 2 292 297
MODDONE	12,2112		1244 3 1244	MPACSRND	00,2050		1120 1 1119	NBDZ	E3,1462		82 2 293 297
MODE	0163		69 26 290 1447	MPACTST	42,3467		345 1 344	NBD2	06,3560		297 1 299
MODECADR	1322		78 10 78 1405	MPACVBUF	7501		1115 4 1111 1333	NBD3	06,3567		297 1 297
MODEEXIT	07,2557		1386 8 1385 1405	MPAC2SAV	0165	=	1447 2 1431 1440	NBPOSPL	33,2037		414 1 440
MODEGOOD	07,3531		1405 1 1405	MPERFMSK	10,3646		1447 2 1430	NBRANCH	11,3135		1307 3 1305 1316
MODESLP	07,3535		1405 1 1405	MPERIOD	26,2106		730 1 729	NBRANCH1	11,3125		1307 1 1306
MODESW	07,2000	=	26 1 1385	MPTEMP	0135		67 63 67 1158	NBRCYCLP	E6,1747	=	104 4 104 653
MODNGOEL	12,2605		1252 2 1252	MR.KLEAN	05,2465		180 2 179 1459	NBRCYCLS	E6,1746	=	104 9 104 678
MODPSOEL	12,2643		1253 2 1253	MRCLEAN	17,2035		896 2 896 916	NBSM	23,3541		1332 2 566 722
MODREG	1011		73 20 179 1464	MRKBUF1	E7,1725	=	123 37 32 733	NBUSMASK	10,3641		1447 1 1434
MODROUTB	04,2010	=	357 1 357	MRKBUF2	E7,1734	=	123 17 123 780	NB1NB2	23,2301		288 1 278
MONADR	40,3341		356 1 356	MRKIDBIT	4674	=	50	NB2NB1	23,2257		287 4 279 280
MONBACK	41,3340		349 1 349	MRKIDFLG	0074	=	50	NCDU	E6,1666	=	111 3 405 406
MONBUSY	41,3341		350 1 349	MRKNVBIT	4702	=	51	NDCMPTST	41,2435		325
MONDEL	41,3310		348 1 348	MRKNVFLG	0102	=	51 1 1441	NDRMSBIT	4701	=	57
MONDO	41,3311		348 1 348	MRKREJCT	07,2307		223 1 223	NDXCHNGE	12,2223		1246 2 1246

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SYMBOL	DEF	H	REFERENCES	SYMBOL	DEF	H	REFERENCES	SYMBOL	DEF	H	REFERENCES
NDXCTR	E5,1421	95	6 414 417	NEWAZMTH	E5,1635	= 96	3 436 445	NJ22	21,3553	999	2 999
ND1	4375	371	6 312 438	NEWAZ1	E5,1635	= 97	2 434	NJ23	21,3604	1000	2 1000
NEARLY1	23,2211	284	1 284	NEWB(S)	20,2545	925		NKVAL	E4,1726	= 87	3 87 888
NEARONE	27,3333	1352	5 796 1349	NEWC(S)	20,3023	931		NNADTAB	42,2133	264	1 263
NEAR1/4	26,3161	830	2 800	NEWDEL	12,2641	1253	2 1252 1253	NNADTEM	0146	67	8 263 340
NEEDLBIT	4702	= 43		NEWDELHI	22,3027	405	1 408	NNTYPTAB	42,2277	267	1 263
NEEDLEIN	17,2155	858		NEWDELX	12,2243	1246	3 1246 1247	NNTYPTEM	0147	67	5 263 339
NEEDLER	21,2404	979	9 529 1057	NEWIBIT	4676	= 58		NN1	E7,1645	= 124	2 273 546
NEEDLER1	21,2415	979	1 979	NEWIFLG	0172	= 58	3 1285 1289	NN1A	E7,1727	= 124	13 124 872
NEEDLER2	21,2446	979	2 242 979	NEWJ(S)	20,2556	925		NN2	E7,1731	= 124	8 124 875
NEEDLES	21,2462	980	1 243	NEWJOB	0067	65	22 186 1367	NO.CORES	01,2657	1178	2 1178 1183
NEEDLES3	21,2455	980	1 979	NEWLIST	05,3361	1064	2 1063 1064	NO.MMS	0035	= 201	1 201
NEEDLEUP	16,2706	901		NEWLOC	0065	= 65	9 1175 1183	NO.T5VAR	21,2607	983	1 982
NEEDLE11	21,2427	979	1 242	NEWMODE	6027	1075	6 1091 1473	NO.WDS	6213	1080	5 1080 1149
NEEDLFLG	0006	= 43	3 237	NEWMODEA	5246	1368	1 197	NO.05G	25,2255	801	1 801
NEG	6710	1097	4 1097	NEWMODEX	5243	1368	14 413 1470	NO.12-10	16,3701	955	1 955
NEG.2	40,2763	342	1 342	NEWOPS	6037	1075	1 1074	NO.13-15	16,3651	954	
NEGAMA	25,2743	813	1 808	NEWPAR	14,2452	706	1 706	NO.16-14	16,3672	955	
NEGBPW	05,3327	912	1 910	NEWPHASE	4114	214	9 428 776	NO.9-11	16,3660	955	1 954
NEGCOS	13,2505	1207	1 1207	NEWPRIO	0063	= 65	12 197 1436	NOACY	17,3151	1014	3 1013
NEGMAX	4674	= 1171	12 407 1193	NEWRNVN	26,2243	741	1 741	NOADJUST	42,3652	885	2 884 885
NEGONE	7716	1170	29 155 1360	NEWROLL	16,3556	953	2 953	NOATTOFF	07,3070	1392	5 138 1391
NEGOPCMD	10,2161	163	1 163	NEWSTATE	12,2660	1254	1 1256	NOAZCHGE	33,3372	437	1 436
NEGOPT	40,2540	328	1 328	NEWTC	12,2141	1245	1 1245	NOBDZ	17,3067	1012	3 1011 1012
NEGOUT	13,2513	1207	1 1207	NEWY(S)	20,3034	931		NOBITS	E5,1452	= 95	
NEGP	12,3421	1265	3 1264 1265	NEXBNKSS	33,3557	442		NOCHANGE	21,2710	985	1 985
NEGSGN	40,2275	312	1 309	NEXTBAND	31,3404	888	2 888	NOCHG	35,2771	470	1 470
NEGTESTS	25,3175	817	1 818	NEXTBNKS	33,3540	441		NOCHORLD	33,3375	437	1 436
NEGTFF	27,3206	1349	2 1348	NEXTCDL	07,2662	1388	4 1388 1389	NOCOARSE	05,2616	182	1 182
NEGTOVFL	12,2331	1247	1 1247	NEXTCOL	11,3465	1313	2 1314	NODAPUP	42,3544	687	1 687
NEGVEL	21,3473	998	3 998	NEXTCORE	01,2717	1179	2 1178	NODDOT	26,3637	1218	1 1213
NEG0	4713	1167	17 130 1470	NEXTES	35,2441	462	1 461	NODIO	26,3645	1218	1 1213
NEG1	7716	= 1171	5 291 1171	NEXTIME	E6,1671	= 111	3 407	NODISKY	25,3600	825	1 824
NEG1/2	4673	1167	9 162 1198	NEXTINCL	05,3366	1064	1 1064	NODOBIT	4712	= 48	
NEG10C	5127	1187		NEXTINSL	05,3511	1066	1 1064	NODOFLAG	0054	= 48	4 203 1412
NEG12	00,3726	1158	3 1126 1148	NEXTLINE	23,2610	508	1 508	NODSPOUT	06,2132	132	2 130
NEG180	40,2751	342	1 341	NEXTOPT	10,2150	163	4 163 164	NODSPY	06,2154	132	1 132
NEG2	7715	1170	7 228 1383	NEXTI	25,3172	817	1 817	NOEBANK	43,3357	1362	1 1363
NEG3	7714	1170	6 567 1469	NEXUS	36,2476	546	2 546	NOFLASH	24,3303	658	1 658
NEG4	6061	1076	3 1017 1360	NINE	4334	= 1171	8 437 1013	NOGAMDOT	37,3612	837	1 837
NEG5	41,2115	318		NINE64	26,2213	739	1 738	NOGAMOUT	15,2671	1040	1 1039
NEG7	5630	= 198		NINETEEN	4374	= 899	2 898 902	NOGIMLOC	22,2736	403	1 403
NETZERO	6070	1077		NJET	17,3402	1022	3 1018 1021	NOGIMRUN	06,2455	143	2 142
NEWANGL	22,3032	405	1 403	NJETSBIT	4674	= 44		NOGO	22,2727	402	2 391 405
NEWANGLE	26,3543	1215	4 1213 1216	NJETSFLG	0017	= 44	3 641 846	NOGOM2	22,2725	402	

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SYMBOL	DEF	H	REFERENCES
NOGUESS	12,3471		1266 1 1264
NOHIAUTO	21,2661		984 1 984
NOIBNKSW	6032		1075 1 1116
NOINT	13,2630		1280 1 1279
NOKILL	43,2764		256 1 256
NOLDCALC	25,2253		801 2 801
NOLEM	17,2653		1008 1 1008
NOLEMVAL	05,3273		912 1 910
NOMONLST	05,2113	=	165
NOMTIG	E7,1447	=	114 3 114 677
NOMTPI	E4,1763	=	89 6 453 469
NOMXFIRE	16,3601		953 1 953
NONAVKEY	05,2745		184 2 184
NOPIE	35,2570		465 1 465
NOPOLY	34,2504		535 1 531
NOPOLYM	37,2161		533 1 535
NOQBRSM	5226		1199 1 127
NOQRSM	5224		1199 4 187 956
NORATE	21,2771		987 1 986
NORESET	07,3232		1396
NORFBIT	4700	=	43
NORFHOR	0004	=	43 4 610 618
NORFINAL	13,3255		1288
NORMADR	42,3314		333 1 332
NORMBNCH	10,3207		1440 1 1446
NORMEX	1340		79 18 459 541
NORMGAM	E4,1615	=	86 5 86 1225
NORMLIZE	37,3145		782 3 210 774
NORMLOP	33,2647		429 1 429
NORMRET	10,3555		1446 2 1444
NORMSW	0156	=	57 8 478 1258
NORMTEM1	1045	=	73 3 712 1437
NORMTEST	CC,3511		1153
NORMT4	C6,2007		128 2 128
NORMUNIT	22,3723		1478 1 1478
NORMUNX1	22,3721		1478
NORMWAKE	10,3461		1444 1 1446
NOROLL	16,3625		954 6 950 953
NOROLL1	16,3712		956 1 957
NOROLL16	16,3720		957 1 954
NOSAM	15,2376		734
NOSAVPIP	37,2725		776 1 775
NOSHIFT	22,3765		1479 6 1478
NOSWBIT	4704	=	55
NOSWITCH	0142	=	55 2 815 824
NOTADDUL	16,2502		680 1 679
NOTBIT12	40,3570		380 2 379
NOTIME	13,3677		1296 2 1294 1295
NOTPLAN	15,2423		734 1 734
NOTSET	35,3710		627 1 627
NOTYET	20,3571		1034 1 1034
NOUN	40,2271		312 1 309
NOUNADD	0145	=	67 29 320 370
NOUNCADR	1017		73 9 317 370
NOUNREG	1002		72 15 187 368
NOUNTEM	0122	=	66 3 320
NOUNTEST	41,2457		325 2 335 336
NOUPDATE	16,2740		902
NOUT	1016		73 9 130 377
NOUTCOM	4717	=	1171 1 187
NOUVEAU	04,2245		196 1 194
NOVAC	5027		1175 35 131 1446
NOVACADR	01,3767		1383 1 1380
NOVAC2	01,2650		1178 1 1175
NOVAC3	01,2653		1178 1 1179
NOVRWRT	35,2644		467 1 468
NOV37NN	04,2475		201 1 193
NOXLNCMD	17,2665		1008 1 1007
NO2Y	17,3430		1024 4 1024
NO2Z	17,3434		1024 3 1025
NPD	E6,1744	=	103 4 961
NPDNODE	17,2226		961
NPJETS	E6,1523	=	105 7 105 1019
NPO	E6,1561	=	103 13 961 963
NPONODE	17,2215		961 1 922
NP1	E6,1563	=	103 1 961
NP1NODE	17,2250		961 1 923
NP1TMP	E6,1736	=	103 9 961 962
NP2	E6,1541	=	103 1 961
NP2NODE	17,2310		962
NP2TMP	E6,1711	=	103 9 962 963
NP3	E6,1543	=	103 1 962
NP3NODE	17,2350		963
NP3TMP	E6,1713	=	103 8 963
NRJETS	E6,1522	=	105 13 105 1025
NRNAG	0040	=	1337 7 765 1347
NRNIOBIT	4676	=	50
NRNIOFLG	0076	=	50
NRNNVBIT	4703	=	51
NRNNVFLG	0103	=	51 1 1441
NRTERN	0020	=	1337 7 765 1346
NRUPTBIT	4707	=	52
NRUPTFLG	0107	=	52
NSEC	15,3206		1046 1 1044
NSUM	20,3157		934 2 923 929
NSUMSC	20,3213		935
NSUMTMP	E6,1711	=	102 14 102 935
NTARGBIT	4710	=	56
NTARGFLG	0146	=	56 3 470
NTRYPRIO	4675	=	795
NUCHANG2	01,3032		1182 1 1187
NUDIRECT	01,3242		1187 1 1187
NUFAZ+10	4126		214
NUJET	E6,1612	=	109 7 109 1055
NUM	40,2076		309 9 308 309
NUMGRPS	4715	=	188 2 183
NUVCSM	E3,1600		83 1 619
NUVLEM	E3,1652		83
NVBNKTEM	1040		73 1 362
NVBUSMSK	10,3644		1447 1 1442
NVCADR	10,3635		1447 1 1443
NVCOM	40,2260		312 1 312
NVDSP	10,3216		1440 2 1441 1447
NVDSP1	10,3245		1440 1 1440
NVMONOPT	4171		362 1 1440
NVQTEM	1037		73 2 362
NVSAVE	0371		71 3 178 1446
NVSBBBNK	4215		362 2 362
NVSBCOM	4200		362 1 374
NVSBENDL	40,3342		356 2 356 358
NVSBWAIT	4461		374
NVSBWT1	4471		374 1 374
NVSUB	4170		362 3 230 1446
NVSUBB	41,2000		316 1 362
NVSUBCOM	4204		362
NVSUBEND	4216		362 4 356 364
NVSUBSY1	04,2550		374 1 374
NVSUBUSY	4456		374 2 374 1443
NVSUB1	41,3534		363 2 316 362
NVSUB2	41,3561		363 1 363
NVTEMP	0123	=	66 9 362 374
NVWORD	0367		71 5 1438 1446
NVWORD1	1145		75 20 624 1442
NVSODSP	10,3246		1440 3 1432 1442
NWAITBIT	4701	=	51

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NWAITFLG	0101	= 51		OCTHIRTY	4722	= 160	2 155	OCT30000	4371	= 184	
NXPOSVEL	40,3672	622	1 622	OCTL700	30,2171	555		OCT30002	6440	= 1171	
NXTBNK	43,3630	1366	2 256 1367	OCTL7000	30,2172	555	2 553 556	OCT31	4113	192	4 346 780
NXTFL33	06,2425	141	7 150 151	OCTL77	30,2170	555	1 556	OCT34BAR	42,3513	346	2 346
NXTIBT	06,2413	141	3 141	OCT00010	4707	= 197		OCT3400	10,3640	1447	1 1437
NXTIFAIL	06,2227	135	11 144 149	OCT00060	21,3020	987		OCT34300	10,3647	1447	1 1430
NXTIFBIT	06,2215	135	3 135	OCT00077	31,3052	620	1 609	OCT35	24,2356	643	
NXTRST	05,2674	183	2 183 184	OCT00300	21,3021	987		OCT37	4362	= 226	4 184 776
NXTSUPR	43,3655	1366	1 1366	OCT01120	04,2375	199	1 195	OCT37737	06,2164	133	1 143
NXXTBNN	33,3137	434		OCT01400	21,3017	987	1 1001	OCT37766	7676	1170	1 971
NYD	E6,1744	= 103	4 964	OCT01760	21,3016	987	1 985	OCT37774	7677	1170	2 904 942
NYDNODE	17,2420	964		OCT02200	20,2142	684	1 683	OCT37776	7700	1170	5 132 1444
NYJETS	E6,1524	= 105	6 1010 1020	OCT02202	24,3001	652	1 652	OCT40	4705	= 160	2 157 158
NYO	E6,1605	= 103	13 964 966	OCT10000	4676	= 184		OCT40001	6056	1076	2 1171 1193
NYONODE	17,2407	964	1 928	OCT10001	7632	= 1171		OCT40010	07,3011	1390	2 1390 1392
NY1	E6,1607	= 103	1 964	OCT10200	10,3666	1448	1 1434	OCT40200	7704	1170	2 1456
NY1NODE	17,2442	964	1 929	OCT11	4334	= 1167	1 575	OCT40201	01,3402	1196	1 1193
NY1TMP	E6,1736	= 103	9 964 965	OCT1103	5645	1459		OCT404	14,2174	698	1 698
NY2	E6,1565	= 103	1 964	OCT12	4377	= 642		OCT40400	5612	1459	2 1433 1458
NY2NODE	17,2502	965		OCT120	4732	= 1171	2 196 957	OCT40420	10,3664	1448	
NY2TMP	E6,1711	= 103	9 965 966	OCT13	4717	= 160	1 156	OCT41	4270	= 753	1 743
NY3	E6,1567	= 103	1 965	OCT14	5660	1460	4 154 1406	OCT50	4726	1168	6 242 1446
NY3NODE	17,2542	966		OCT140	4733	= 1171		OCT51	43,3076	258	2 258 259
NY3TMP	E6,1713	= 103	8 966	OCT1400	4744	1168	10 370 1378	OCT53	24,2355	643	
NZERO	17,2207	899	1 896	OCT14000	4761	= 1375	2 1374 1375	OCT54	06,2754	154	1 138
N1	20,3406	938	1 934	OCT15	4720	1167	4 152 1145	OCT55000	41,3711	378	1 378
N2	20,3407	938	1 934	OCT15000	4762	= 154	1 152	OCT60000	4105	= 1171	14 183 1444
N22ORN17	0220	= 61	2 237 238	OCT16	4333	= 1145	2 733 1145	OCT605	34,3736	882	3 844 875
N2217BIT	4705	= 61		OCT16000	21,3023	987	4 985 996	OCT612	34,3737	882	1 856
N3	20,3410	938	1 934	OCT17	27,2472	575	1 574	OCT613	34,3740	882	1 862
N4	20,3411	938	1 934	OCT1720	06,2760	154	1 150	OCT62	4731	= 1410	1 1410
N45PROC	35,3053	472	1 471	OCT176	00,2126	1122	2 1128	OCT66	14,2704	710	1 708
N49DISP	E7,1501	= 118	12 273 615	OCT177	6043	= 1383	1 1380	OCT67777	10,3663	1448	
N5	20,3412	938	1 935	OCT17770	4765	1169	2 1373 1375	OCT7	4716	= 1449	5 1373 1449
N6	20,3413	938	1 935	OCT20100	10,3670	1448	1 1433	OCT70	05,3152	188	1 185
N7	20,3414	938	1 935	OCT203	37,2332	552		OCT740	06,2761	154	1 147
==========				OCT217	5651	1459		OCT74160	05,3153	188	1 185
OBLATE	11,2725	1305	2 1301 1302	OCT220	07,3612	1408	1 1407	OCT75	06,2755	154	1 153
OBTAINLL	30,2213	556	1 555	OCT23	4374	= 1171	1 1080	OCT77000	06,2762	154	1 147
OCCOS	14,2216	702	2 701 702	OCT24	4112	192	5 160 661	OCT7777	05,2723	184	
OCCULT	14,2457	706	2 705	OCT24100	10,3402	1443	1 1431	OCT77770	5630	1459	4 198 1449
OCDUFTST	06,3224	160	2 155 158	OCT25	4376	= 1171		OC14400	33,2441	422	1 414
OCTAL3	6214	1080	1 1171	OCT27	11,3720	1317	1 1302	OC24100	43,2127	231	1 230
OCTAL30	43,2475	243	1 242	OCT27/24	24,2354	643	1 650	OC40010	06,2753	154	1 153
OCTBACK	41,3401	353	1 356	OCT272	06,2756	154	1 147	OC40200	27,2473	575	

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OFFTUNIT	22,3763		1479 1 1479	OMEGAYB	E6,1535	=	100 3 921 922	OPTNSW	0046	=	47 3 516
OGA	E6,1674	=	102 6 102 951	OMEGAYC	E6,1527	=	100 2 896 921	OPTN1	04,3154		516 1 516
OGAD	E6,1450		99 2 648 901	OMEGAZB	E6,1537	=	100 3 927	OPTN2	04,3227		517 1 516
OGAERR	E6,1674	=	102 1 901	OMEGAZC	E6,1531	=	100 1 927	OPTSTALL	07,3512	=	1405 2 444 723
OGANOW	E6,1672	=	102 10 102 949	OMEGMOON	13,3013		1283 1 1283	OPTTEST	06,2130		132 2 132
OGAPAST	E6,1673	=	102 3 102 949	ONCEMORE	33,3041		432	OPTVARK	20,3125		933 2 922 928
OGARATE	E6,1533	=	103 8 949 952	ONE	4712	=	1171 184 130 1478	OPTVARKP	20,2435		922
OGC	E5,1757	=	92 19 92 1324	ONE/C	31,3027		619 2 614	OPTVARKY	20,2713		928
OGCPL	33,2444		422 1 432	ONEBIT	04,3516		1255 1 1266	OPTX	0036	=	36
OGF	E6,1702	=	111	ONEB4	26,2215		739 1 739	OPTXCMD	0054	=	37
OHWELL1	27,3356		1465 5 1465	ONEOPP	33,3117		433 2 419 436	OPTY	0035	=	36 2 78
OHWELL2	27,3401		1465 4 1465 1466	ONEORTWO	5315		1374 1 1375	OPTYCMD	0053	=	37
OKMAX	35,2415		461 1 461	ONESEC	22,3204		407 4 406 407	OPTZERO	06,3151		158 1 157
OKPHI	22,2723		401 1 401	ONESEK	21,2143		971	OPT2	10,2044		162 1 162
OKTHETA	22,2703		401 1 401	ONETHOU	17,2210		899 1 897	ORBITAL	11,2000	=	26 1 1298
OKTOCOPY	10,2664		1434 2 1434 1439	ONMNITOR	37,2773		778 1 778	ORBITAL1	11,2000	=	26 1 1317
OKTOENT	10,3437		1443 1 1446	ONROLL	16,3450		951 1 951	ORBITAL2	13,2000	=	27 1 1317
OKTOGRAB	13,3445		1290 1 1290	OP/INERT	43,2142		232 2 232 233	ORBWFBIT	4705	=	49
OKTOPLAY	10,2725		1435 3 1434	OPDEGIN2	40,3007		342	ORBWFLAG	0066	=	49 13 202 1314
OKU12	22,2250		393 1 393	OPDEGOUT	40,2524		328 1 327	ORDERBIT	4705	=	59
OKU21	22,2224		393 1 393	OPFAILOF	06,3252		160 1 160	ORDERSW	0201	=	59 3 1252 1253
OKU31	22,2274		394 1 394	OPFAILON	06,3235		160	ORIG	E4,1673	=	86
OK2DELAY	00,3744		1452 1 1452	OPIMDIFF	43,2153		232 1 232	ORIGCHNG	11,3304		1309 1 1309
OLDAZMTH	E5,1637	=	96 3 434 437	OPJUMP	6046		1075 1 1075	ORIGEX	E4,1670	=	86 4 86 1310
OLDAZ1	E5,1637	=	97	OPJUMP2	6216		1081 1 1075	OTHERS	13,3501		1292 1 1293
OLDBODY1	E6,1503	=	112	OPJUMP3	6232		1082 1 1081	OTHERV	04,3420		521 1 520
OLDBODY2	E6,1504	=	112	OPONLY	06,2342		138 1 137	OTHINT	35,3373		498 1 498
OLDBODY3	E6,1505	=	112	OPTCADR	1323	=	78 3 187 698	OTHPREC	13,3036	=	32 5 448 505
OLDBT1	1074	=	74 1 780	OPTCOARK	43,2201		235 1 233	OTHSHIP	23,2423		505
OLDELP	E6,1706	=	108 3 108 1039	OPTCOARV	43,2200	=	235 1 235	OUT	13,2154		502 1 502
OLDELQ	E6,1707	=	108 3 108 1038	OPTC1	43,2223		235 3 235	OUTHERE	0161	=	1447 3 1443 1445
OLDELR	E6,1710	=	108 3 108 1039	OPTDATA	33,3435		440 1 440	OUTLINK	0057	=	37
OLDPRIO	5327		1374 1 1377	OPTDEGIN	40,3002		342 1 341	OUTPUT	20,2113		684 3 683
OLDUYA	E7,1533	=	115 3 115 833	OPTDRIVE	10,2000		161 1 132	OUTTAG	E6,1611	=	109 4 109 1056
OMEG/MS	33,2447		422 2 421 422	OPTDRV	10,2000	=	26 1 161	OUTO	0010	=	38 5 129 133
OMEGA	E7,1457	=	118 9 118 1223	OPTIND	1303		77 25 155 696	OVERADAY	23,2245		287 1 287
OMEGAB	E6,1533	=	100 4 100 103	OPTINITF	05,3161		188 1 179	OVERFFIX	33,2276		419 2 417 421
OMEGAC	E6,1525	=	100 7 100 675	OPTINITR	05,3162		188 1 182	OVERFLOW	6766		1100 3 1099 1123
OMEGACLC	16,2254		674	OPTIONVN	23,2406		505 1 504	OVERFLWY	6763		1100 4 1098 1123
OMEGAES	E4,1546	=	86 1 738	OPTIONX	1051	=	73 1 264	OVERFLWZ	6760		1100 4 1098 1123
OMEGAM1	E5,1642	=	94 3 94 1224	OPTION1	1131		75 10 264 1437	OVERNOUT	25,3571		824
OMEGAM2	E5,1650	=	94 3 94 1224	OPTION2	1132		75 12 274 846	OVF+	00,2414		1129 2 1129
OMEGAM3	E5,1656	=	94 3 94 1225	OPTMODES	1331		78 34 139 1456	OVFIND	0121		66 13 841 1181
OMEGAXB	E6,1533	=	100	OPTMON	06,2765		155 2 132	OVFLCLR	12,3213		1262 1 1262
OMEGAXC	E6,1525	=	100	OPTNREG	E5,1473	=	95	OVRLINE	15,3443		1052 1 1052

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OVRLINE1	15,3451		1052 2 1050 1052	PDSUMC	20,2522		924	PHSNAME3	E3,1442		81
OVRLINE2	15,3453		1052 1 1052	PDVL	6526		1093 1 1083	PHSNAME4	E3,1444		81
OZONE	10,2016		161 2 161	PDXCHNGE	12,2257		1246 2 1246	PHSNAME5	E3,1446		81 2 838
==========				PEGGY	05,3245		911 2 911	PHSNAME6	E3,1450		81
P	E5,1741	=	93 13 93 1270	PERFCHEK	10,3263		1441	PHSPART2	01,3755		1383 1 1383
P(T1)	E7,1755	=	124 3 124 855	PERFDLAY	E5,1656	=	97 3 415 434	PHSPRDT1			1054 73 5 1374 1382
P/RJCODE	15,3220		1047 4 1042 1055	PERFERAS	33,3035		432	PHSPRDT2			1056 73 3 195 608
P/RPRE	0032	=	125 2 858 859	PERFMASK	10,3623		1447 2 1435 1437	PHSPRDT3			1060 73 1 198
PAC	E5,1775	=	92 11 92 733	PERF2MSK	10,3627		1447 2 1435 1437	PHSPRDT4			1062 73 1 197
PACLIM	20,2451		923	PERF4MSK	10,3631		1447 1 1437	PHSPRDT5			1064 73 1 812
PACTIVE	05,2702		183 1 183	PERIAPC	22,3322		486 1 544	PHSPRDT6			1066 73 2 624
PACTOFF	E6,1425		98 19 166 916	PERIAPO1	22,3312		486 4 455 630	PHS2CADR	01,3762		1383 1 1378
PACTTMP	E6,1703	=	102 4 102 905	PERIODCH	12,2070		1244 1 1244	PI/16	27,3317		1352 2 1348 1350
PADLONG	1263	=	77 2 77 526	PERORLIN	20,2401		922	PI/4.0	23,3106		565 2 564 615
PARAM	C4,3524		1257 4 858 1269	PERRB	E6,1615	=	101 3 101 925	PICAPAR	14,2324		704 1 693
PARAM30	35,3665		626 3 625 627	PFAILCK	07,3056		1392 1 138	PICBXT	14,2521		707 1 707
PASSIVE	22,3406		488 2 462 488	PFAILCK2	07,3051		1392 1 1392	PICEND	14,2513		707 1 705
PASTEOPT	4146		349 1 349	PFORWARD	20,2410		922	PICGXT	14,2517		707 1 707
PASTERET	24,3300		658 1 658	PFRATBIT	4707	=	48	PICKANG1	27,2235		386 1 386
PASTEVB	4140		349 2 349 356	PFRATFLG	0051	=	48 2 637 709	PICKAXIS	27,2256		387 2 385
PAXERR	E6,1476	=	110 1 1057	PGNCSALT	1272	=	77 1 526	PICKX	27,2310		387 2 387
PAXERR1	E6,1713	=	108 8 108 1057	PHASCHNG	5301		1373 109 189 1471	PICI	14,2361		705 3 705 706
PBIAS	24,3677		670 1 668	PHASETAB	10,2000	=	26 2 1368 1375	PIC2	14,2364		705 1 705
PBIASX	E3,1452		81 1 81	PHASE1	0753		72 3 183 1377	PIC3	14,2373		705 6 705 706
PBIASY	E3,1454		81	PHASE2	0755		72	PIC4	14,2376		705 1 705
PBIASZ	E3,1456		81	PHASE3	0757		72	PIINVERS	36,2010		539 1 541
PBLASTOK	17,3251		1019 1 1018	PHASE4	0761		72	PIKUP20	37,2273		551 1 205
PBODY	E4,1550		86 18 86 1316	PHASE5	0763		72 3 528 784	PINACT	05,2707		184 1 183
PBYPASS	17,3421		1023 1 1018	PHASE6	0765		72	PINBALL1	40,2000	=	31 1 308
PCDUDCTS	20,2341		921	PHEXIT	13,3155		1286 1 1286	PINBALL2	41,2000	=	31 1 316
PCDLYPST	E6,1655	=	102 4 102 933	PHICALC	32,2146		634 1 634	PINBALL3	42,2000	=	31 2 263 331
PCDUZPST	E6,1656	=	102 4 102 933	PHIDOT	E6,1705	=	108 7 108 1057	PINBALL4	04,2000	=	25 1 367
PCLOOP	05,2641		183 1 183	PHIV	E4,1565	=	86 6 86 1312	PINBRBIT	4705	=	51
PCMD	E6,1631	=	101 8 101 925	PHI2	E7,1760	=	124 6 124 870	PINBRFLG	0105	=	51 1 1440
PCON	E7,1717	=	124 3 124 878	PHI333	E6,1506	=	100 11 100 911	PINBRNCH	10,3176		1439 7 193 1447
PCOPY	20,2544		925 2 917 924	PHSBB1	E3,1437		81	PINDEX	E6,1520	=	105 3 105 1009
PCOPYCYC	20,2542		924	PHSBB2	E3,1441		81	PINIOMSK	10,3475		1444 1 1444
PDA	0026	=	70 2 280	PHSBB3	E3,1443		81	PINMASK	7707	=	1447 1 1440
PDAPEND	20,2543		924	PHSBB4	E3,1445		81	PINSUPBT	4215	=	362 5 237 366
PDDL	6472		1092 1 1083	PHSBB5	E3,1447		81	PINSUPER	40,2000	=	31 1 237
PDELOFF	E6,1625	=	101 5 101 922	PHSBB6	E3,1451		81	PINTEGRL	20,2353		921
PDLADDER	20,2503		923	PHSCHK2	16,3242		916	PINTEST	43,2002	=	376
PDSPFBIT	4677	=	50	PHSCHNG2	10,2355		1375 1 1374	PIPABIAS	E3,1452	=	81 1 290
PDSPFLAG	0077	=	50 3 382 563	PHSNAME1	E3,1436		81 5 1375 1380	PIPACHK	33,2131		416 1 415
PDSUM	E6,1543	=	100 4 100 925	PHSNAME2	E3,1440		81	PIPAGE	1230	=	76 5 76 784

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PIPASC	33,3675		444 1 430	POINTVSM	E6,1756	=	111 5 111 667	POS1/4	11,3700	=	1317
PIPASCF	E3,1453	=	81 1 290	POINT1	26,3151		830 1 817	POUT	20,2452		923
PIPASCFX	E3,1453		81 1 81	POINT2	26,3153		830	POWERED	0003	=	202 4 202
PIPASCFY	E3,1455		81	POINTB	26,3267		832 1 583	POWFLITE	23,2000	=	28 1 1329
PIPASCFZ	E3,1457		81	POLISH	0117		66 38 66 1166	POWFLIT1	23,2000	=	28 1 1336
PIPASR	37,3163		783 2 774 775	POLLEY	5006		1174 2 1174	POWFLIT2	23,2000	=	28 1 284
PIPATASK	33,2153		416 2 416	POLY	7171		1106 10 284 1351	POWRSERS	7164		1106 1 531
PIPAX	0037	=	36 14 264 1472	POLYCNT	0140	=	67 4 1106 1107	PRAXIS	E7,1722	=	123 5 123 585
PIPAY	0040	=	36 5 425 1472	POLYCOEF	12,3034		1259 1 1261	PRDTTAB	01,2000	=	205 3 1381 1383
PIPAZ	0041	=	36 8 425 1472	POLYCOM	7201		1106 1 1106	PRE-HUNT	25,3006		814 1 209
PIPCHECK	37,3015		779 1 779	POLYLCC	E6,1673	=	111 1 535	PREBJUMP	5250		1368
PIPCTR	1227	=	76 4 76 778	POLYLCCP	7211		1107 1 1107	PREC/TT	04,3357		520 2 516
PIPFAIL	06,2632		150 1 154	POLYNUM	E6,1661	=	111 3 111 531	PRECHECK	24,2517		646 3 207
PIPFREE	07,3112		1393 1 780	POLYRET	0141	=	67 3 1106 1107	PRECIBIT	4703	=	49
PIPFREE2	07,3107		1393 1 1393	POLYSTOP	E6,1703	=	112 2 112 531	PRECIFLG	0064	=	49 6 203 1289
PIPINDEX	E5,1422		95 4 416 419	POLY2	7214		1107 1 1107	PRECSET	22,3354		488 4 454 520
PIPJOBB	33,2170		416 1 416	PONG	33,2250		417 1 417	PRECX	32,3047		863 3 859 862
PIPLOOP	37,3031		779 2 779	PON2	33,2244		417 1 417	PREC100	32,2511		858 1 845
PIPSDONE	37,2654		775 1 785	PON4	33,2237		417	PREC120	32,2517		858 1 862
PIPTIME	1204		76 18 76 1293	POODAPAD	04,2372		198	PREC125	32,2525		858 1 861
PIPTIME1	1245	=	76 8 76 1295	POODOO	5622		1459 7 356 1435	PREC130	32,2551		859 1 858
PIPUSE	07,3075		1393 2 299 426	POOFIZZ	04,2221		196 1 195	PREC132	32,2554		859 1 861
PIPUSE1	07,3101		1393	POOH	04,2146		194	PREC140	32,2557		859 1 859
PITCHANG	0026	=	885	POOKLEAN	05,2471		180 1 195	PREC150	32,2562		859
PITCHDAP	20,2326		921 1 938	POS-2.5	24,3701		688	PREC155	32,2576		859 1 859
PITCHTIM	17,3213		1018 3 1024 1025	POSDEL	12,2625		1253 1 1252	PREC160	32,2600		859 1 859
PITCHTS	20,3401		938 2 927 933	POSDELX	12,2231		1246 1 1246	PREC162	32,2612		859 1 859
PJETS	17,2762		1010 3 1009 1030	POSEC	42,3327		333 2 333	PREC165	32,2620		859 1 859
PLANET	15,2363		734 4 708 721	POSECADR	26,2430		747 1 743	PREC167	32,2634		860 1 860
PLANTIN	26,2000	=	29 1 1210	POSEXIT	E6,1724	=	109 5 109 838	PREC168	32,2636		860 1 859
PLANVEC	E5,1600	=	90 5 90 721	POSGN	40,2310		312 1 309	PREC170	32,2645		860
PLAYJUM1	10,2743		1435 3 1440 1447	POSITCN	E5,1423		95 5 414 422	PREC172	32,2712		861 1 860
PLAYTEM1	0155	=	1448 27 1430 1438	POSMAX	4672		1167 37 144 1457	PREC173	32,2714		861 1 860
PLAYTEM3	0157	=	1448 3 1437 1445	POSNV	E5,1530	=	96 2 431	PREC174	32,2724		861 1 861
PLAYTEM4	0160	=	1448 11 1429 1445	POSN17C	33,3164		434 2 434 437	PREC175	32,2732		861 2 858 860
PMANNOX	E6,1657	=	107 5 107 993	POSOPCMD	10,2144		163 1 163	PREC205	32,2747		861
PMISC	20,2575		925	POSTAND	26,3734		1411 2 1410 1411	PREC205M	32,2766		861 1 861
PMMASK	10,3642		1447 1 1435	POSTBURN	24,2155		639 3 208 651	PREC206	32,2771		862 1 861
PNLADDER	20,2471		923	POSTCOM	26,3763		1412 2 1412	PREC207	32,3001		862 1 861
PNSUM	E6,1541	=	100 5 100 925	POSTJUMP	4574		1070 67 138 1479	PREC210	32,3020		862 1 862
PNSUMC	20,2502		923	POSTTPI	E5,1640	=	90 4 273 546	PREC220	32,3033		862 1 861
POFFSET	20,2436		922 1 961	POST41	24,2204		640 5 638 659	PREC225	32,3045		863 1 862
POINTAXS	31,2272		611 2 610 611	POSVECT	E4,1736	=	87 5 87 890	PREDANG	E7,1770	=	116 2 116 822
POINTER	0156	=	1383 7 1381 1383	POSVEL	21,3463		998 3 998	PREDICT3	25,3336		821 1 821
POINTEX	1150	=	76 6 76 613	POS1/2	4675	=	1171 9 1036 1193	PREDOT	7123		1105 2 1110 1113

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PREDSPAL	40,3321	356	1 327	PRIO21	4766	1169	1 773	PTAUPOS	17,3223	1018	1 1018
PREFINAL	25,3326	821	4 807 821	PRIO22	7657	1169	1 437	PTBAD	05,2720	184	3 183
PREL	E6,1701	= 108	7 108 1058	PRIO23	7660	1169		PTIGINC	E4,1423	85	2 458 519
PRELTERM	33,3417	437	2 437	PRIO24	7661	1169	1 698	PTOACSM	13,2662	1281	2 258 1286
PREMM1	04,2440	= 200	3 193 201	PRIO25	7662	1169	1 507	PTOALEM	13,2735	1282	1 1286
PREMTRXC	E5,1632	= 96	5 436 445	PRIO26	7663	1169	4 408 574	PTI/16	26,3273	832	2 817
PREMTRX1	E5,1632	= 97	1 434	PRIO27	7664	1169	4 573 660	PULSEINU	22,3650	1476	1 421
PRENVESY	4453	374	1 374	PRIO3	4752	1169	2 494 1171	PULSEM	15,2207	711	
PREPTVC	24,2576	648	1 650	PRIO30	4371	= 1171	16 179 1446	PURRS4	10,3043	1437	2 1435 1437
PREREAD	37,2604	773	3 211 755	PRIO31	7665	1169	3 299 957	PUSH	00,3247	1149	1 1085
PREREAD1	37,2631	774	2 525 774	PRIO32	7667	1169	5 216 1442	PUSHLOC	0166	69	28 1080 1181
PRERRORS	43,3243	1360	3 1361	PRIO33	7670	1169	1 1434	PUSHUP	6164	1080	1 1076
PRESINE	00,3525	1154	2 1154	PRIO34	7671	1169	8 222 1171	PUTADD	41,2331	321	3 321
PRESTAND	26,3657	1410	1 1410	PRIO34A	7671	= 971		PUTCOM	41,3070	339	8 335 337
PRESTORE	6370	1088	1 1088	PRIO35	7672	1169	1 1192	PUTCOM2	41,3150	340	4 339 342
PREVGAM	26,3045	765	2 760 761	PRIO36	7673	1169		PUTDCSF2	41,3200	340	1 340
PRE40.6	20,2040	682	2 211 661	PRIO37	7674	1170	6 197 1444	PUTDECSF	41,3165	340	2 339 340
PRFMSTAQ	4720	= 721	1 719	PRIO4	4677	= 1171	1 243	PUTDPCOM	41,3123	339	1 340
PRFTRBIT	4701	= 53		PRIO5	4754	1169	7 195 1279	PUTNORM	41,3132	339	1 339
PRFTRKAT	0120	= 53	4 257 585	PRIO6	4755	1169	4 164 1360	PUTSFNOR	41,3177	340	1 340
PRFUNIT	34,3543	585	1 585	PRIO7	4756	1169	6 248 508	PUTXY	41,2710	336	
PRIOBORT	10,2723	1435	2 1433 1442	PROCEED	10,3537	1445	1 1443	PUTXYZ	41,2626	335	
PRIOCHNG	5103	1177	14 230 1444	PROCEEDE	06,2075	131		PWORD	17,2671	1008	2 1008
PRIOCH2	01,3113	1184	1 1177	PROCESSW	06,3023	155		PWORD1	E6,1453	= 99	4 99 1029
PRIODBIT	4675	= 50		PROCKEY	40,3353	359	1 131	PWORD2	E6,1454	= 99	4 99 1030
PRIODFLG	0075	= 50		PROCLMKS	31,3300	887	1 887	PYJETS	0005	= 38	2 1033 1042
PRIODSP	10,2635	1433	1 573	PROCTMCN	06,2244	137	1 137	PYTABLE	17,2743	1010	4 1009 1026
PRIODSPR	10,2632	1433	1 1458	PROGLARM	5571	1458	1 1457	POOHCHK	13,3326	1289	2 1288 1289
PRIOENT	5545	1457	2 1458 1460	PROG20	37,2207	550	1 199	P05P06	26,2000	= 29	1 1410
PRIOLARM	10,3671	1458	1 698	PROG21	37,2001	448	1 199	P06	26,3655	1410	1 199
PRIOOCT	10,3657	1448	2 1431 1438	PROG22	30,2000	553	1 199	P1FILJMP	20,2402	922	
PRIOPLAY	10,2744	1435	2 1431 1434	PROG22A	30,2034	553	2 553 555	P11	34,2002	524	1 438
PRIORITY	0167	69	29 186 1436	PROG22B	30,2107	554	1 553	P11+7	34,2013	524	1 528
PRIOTIME	1147	75	2 1434 1444	PROG22C	30,2151	555		P11FOUR	23,2000	= 28	1 537
PRIO1	4701	= 1171	1 529	PROG52	15,2000	691	3 199 691	P11ONE	34,2000	= 30	2 524 533
PRIO10	4676	= 1171	6 245 653	PRONVBIT	4704	= 51		P11OUT	33,2451	422	1 529
PRIO11	4757	1169		PRONVFLG	0104	= 51	1 1441	P11SCADR	34,2301	529	1 527
PRIO12	4603	1070	2 178 651	PROUND	20,2444	922		P11TWO	37,2000	= 31	1 531
PRIO13	4760	1169	4 608 755	PROUT	33,2424	421	1 526	P11XIT	34,2276	529	1 526
PRIO14	4761	1169	7 383 1378	PRSHRTMP	4431	372	4 329 331	P17	35,3431	547	1 199
PRIO15	4762	1169	4 154 1446	PRT2CADR	01,3763	1383	1 1380	P17.1	35,3434	547	3 547 548
PRIO16	4763	1169	12 154 826	PSIV	E4,1573	= 86	3 86 1312	P17.2	35,3500	548	1 548
PRIO17	4764	1169	1 294	PSI333	E6,1507	= 100	6 100 911	P17.3	35,3504	548	
PRIO2	4700	= 1171		PSTROKER	20,2335	921		P17S	36,2000	= 30	1 539
PRIO20	4675	= 1171	8 240 795	PTAUNEG	17,3221	1018	1 1018	P17S1	35,2000	= 30	1 547

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SYMBOL	DEF	H	REFERENCES	SYMBOL	DEF	H	REFERENCES	SYMBOL	DEF	H	REFERENCES
P2FILJMP	20,2460		923	P3XORP7X	35,3106		474 1 471	P40CSM	24,2002		637 1 199
P20.1	37,2243		551 1 551	P30	35,3604		625 1 199	P40GMB	24,2060		638
P20.2	37,2247		551 1 551	P30/P31	35,3636		626 3 625 626	P40MINDB	24,2171		640
P20.3	37,2261		551 1 551	P30/RET	1127	=	75 2 626	P40OK99	24,2352		642 1 658
P20FLGON	35,3746		636 5 453 547	P30/31RT	E7,1664	=	122 4 626 627	P40PVA	24,2023		637
P20R52JB	37,2321		552	P30PHSI	35,3555		624	P40RCS	24,2163		639 2 639 659
P20S	37,2000	=	31 4 448 558	P30S	35,2000	=	30	P40S	24,2000	=	28 3 637 688
P20S1	30,2000	=	29 2 553 556	P30S1	35,2000	=	30 2 624 636	P40S/C	24,2013		637 1 637
P20S2	23,2000	=	28 2 563 603	P30S1A	31,2000	=	30 1 628	P40S/F	24,2015		637 2 641
P20S3	34,2000	=	30 1 567	P31	35,3620		626 1 199	P40S/RS	24,2106		638 1 642
P20S4	34,2000	=	30 2 580 606	P34	35,2000		453 1 199	P40S/SV	24,2113		638 1 208
P20S6	30,2000	=	29 1 587	P34/P74A	35,2003		453 2 453 454	P40SET	24,2125		639 1 639
P21	E6,1666	=	111	P34/P74B	35,2020		453 1 453	P40SNEWM	24,2146		639 1 639
P21CNENN	37,2077		449 3 448 548	P34/P74C	35,2022		453 1 455	P40SXTY	24,2032		637
P21PROGA	37,2033		448 1 449	P34/P74D	35,2063		454 1 454	P40S1	16,2000	=	27 3 663 676
P21PROG1	37,2011		448 1 449	P34/P74E	35,2066		454 1 454	P40S3	30,2000	=	29 1 665
P21PROG2	37,2042		448 1 448	P35	35,2153		458 1 199	P40S5	22,2000	=	28 1 670
P21PROG3	37,2050		449 1 448	P35/P75A	35,2162		458 1 458	P40TMP	E7,1672	=	121 13 32 644
P21PROG4	37,2053		449 1 448	P35/P75B	35,2167		458 1 458	P40TSK	24,2401		643
P21TIME	E4,1715	=	87 14 87 606	P37	36,2502		841 6 199 845	P40TTOG	24,2044		637
P22DNLST	0004	=	202 1 202	P37E	36,2747		844 1 844	P41/DSP	24,2267		641 1 637
P22MAXDE	30,2165		555 1 554	P37G	36,3024		845 1 845	P41/P40	24,2252		641 2 637 646
P22MKBIT	4700	=	49	P37GFRB1	36,3205		848 2 841 845	P41CSM	24,2235		641 1 199
P22MKFLG	0061	=	49 2 553 588	P37N	36,3027		845	P41REDSP	24,2304		642 1 646
P22OVER	30,2156		555	P37PROC	36,3240		848 1 848	P47/DSP	24,2476		645
P22SUBRA	37,2333		555 2 554 555	P37Q	36,3053		846 1 846	P47BCD	24,2471		645
P22SUBRB	30,2217		556 2 554 556	P37R	36,3060		846 1 846	P47BCDY	24,2463		645 3 207 645
P23	31,2021		608 1 199	P37T	36,3064		846 1 846	P47CSM	24,2412		644 1 199
P23.00	31,2047		608 1 615	P37U	36,3147		847 1 847	P50S	15,2000	=	27 5 691 732
P23.05	31,2060		609 1 609	P37V	36,3151		847 1 847	P50S1	14,2000	=	27 5 695 718
P23.12	31,2144		610 1 609	P37W	36,3163		847 2 847 848	P50S2	16,2000	=	27 3 694 731
P23.15	31,2070		609 2 609 611	P37OALRM	32,2251		850 1 845	P51	14,3061		718 2 199 718
P23.16	31,2104		609 1 609	P37OGCF	36,3231		848 5 841 846	P51A	14,3070		719 1 718
P23.17	31,2107		609 1 609	P37OGCFR	36,3215		848 2 845 848	P51AA	14,3072		719 2 719 721
P23.18	31,2137		610 1 610	P38	04,3103		515 1 199	P51B	14,3141		720 1 719
P23.19	31,2142		610 1 610	P39	04,3324		519 1 199	P51C	14,3154		720 1 721
P23.20	31,2150		610 2 610	P39/P79A	04,3335		519 1 519	P51C.1	14,3167		720 1 720
P23.30	31,2156		610 3 610	P39/P79B	04,3344		519 1 518	P51C.2	14,3172		720 1 720
P23.55	31,2170		610 1 610	P39/79SW	0176	=	59 4 516 519	P51D	14,3204		720 1 720
P23.56	31,2224		611 1 610	P39P79	04,3261		518 1 518	P51E	14,3212		720 1 720
P23.57	31,2226		611 1 611	P39SWBIT	4702	=	59	P51F	14,3230		721 1 721
P23.60	31,2236		611 1 609	P40BLNKR	24,2143		639 1 643	P51FIVE	4715	=	721
P23.65	31,2261		611 1 611	P40CKLS2	24,2344		642 1 638	P51G	14,3253		721 1 721
P23.85	31,2265		611 1 610	P40CLK	24,2264		641	P51ZERO	4714	=	721 1 719
P23ABRT	37,2437		559 1 558	P40CNV85	24,2314		642 3 641 657	P52A	15,2016		692 2 692

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P52B	15,2020		692 1 692	P77	35,3433		547 1 199	Q7MIN	26,3311	=	832 1 816
P52C	15,2120		693 3 692 710	P78	04,3106		515 1 199	==========			
P52D	15,2100		693 2 693	P79	04,3331		519 1 199	R	0002	=	885 3 884
P52E	15,2135		693	==========				R(T1)	E7,1645	=	124 7 124 880
P52F	15,2140		693 2 693 694	Q	0002	=	36 366 38 1475	R(T1)/	E7,1637	=	124 7 124 865
P52I	15,2145		693 1 693	Q+1	6706		1097 4 130 1445	R(T2)/	E7,1655	=	124 12 124 866
P52J	15,2110		693 1 692	Q+10000	4602		1070 1 1072	R*TL**P	23,3606		1333 2 1335
P52LS	16,2506		694 1 693	Q+2	6710	=	1097 4 1177 1454	R-OTHER	E3,1721		83 4 167 283
P52T	15,2041		692 2 692	QAXERR	E6,1572	=	110 3 110 1045	R-TO-RP	26,3366		1212 4 593 1305
P53	14,3061	=	718 1 199	QCHAN	0002	=	38 2 1165	R/APRE	0034	=	125 3 858 859
P54	15,2000	=	691 1 199	QMAJ	0300	=	69 11 69 731	RACFAIL	E6,1626	=	106 10 106 1024
P60S	26,2000	=	29 1 740	QMIN	E5,1777	=	92 16 97 735	RACTCADR	05,2724		184 1 184
P60S1	26,2000	=	29 1 748	QPLAC	E5,1424		95 4 443 445	RACT3	E7,1537	=	119 25 119 629
P60S2	26,2000	=	29 2 751 759	QPLACE	E5,1425		95 14 201 434	RAD	E6,1766	=	111 1 112
P60S3	26,2000	=	29 1 754	QPLACES	E5,1426		95 6 32 526	RADCADR	1324	=	78 1 187
P60S4	10,2000	=	26 1 768	QPRET	0052	=	37 27 216 1313	RADMCON	31,3033		619 1 618
P60S5	27,2000	=	29 1 766	QREL	E6,1702	=	108 6 108 1045	RADSTALL	07,3514		1404 1 575
P61	26,2217		740 1 199	QRUPT	0012	=	36 21 128 1414	RAFAIL	17,3014		1011 1 1011
P61.1	26,2267		741 1 761	QSAVEC	E4,1766	=	88 5 89 548	RAKE	04,2333		198 2 198
P61.2	26,2276		741 2 741 742	QTEMP	E7,1657	=	120 22 120 675	RANGE	E4,1720	=	87 11 87 622
P61.3	26,2232		741 2 744 749	QTEMP1	E7,1730	=	121 6 642 666	RANGEB14	27,2470		575 1 575
P61.4	26,2235		741 1 741	QTSN45	23,3426		1327 1 1321	RANGER	25,2563		810
P62	26,2320		743 1 199	QUADANGL	22,3504		1006 2 1005	RANGERD	27,2415		574 1 568
P62.1	26,2342		744 1 1035	QUADRCT	22,3003		404 2 403 671	RANGERD1	27,2435		575
P62.2	26,2326		743 1 1037	QUARTER	4676	=	1171 9 278 1158	RANGERD2	27,2443		575 1 575
P62.3	26,2402		745 3 743 820	QUICKIGN	24,3474		662	RANGERD3	27,2447		575 1 575
P62.3CAD	26,2401		745	QUICTRIG	23,3510		1331 2 658 1331	RAPO	0020	=	1343 1 1343
P63	26,2406		746 2 745	QUIKDSP	06,2136		132 1 128	RAPREC	E7,1575	=	120 2 459 462
P63.1	26,2420		746 2 745 749	QUIKOFF	06,2167		133 1 132	RASFLAG	0106	=	62 10 182 1290
P63FLAG	E6,1727	=	109 7 744 1046	QUIKREAD	37,2776		778 2 775 778	RATEAVG	15,2550		1033 3 1038 1039
P64	26,2432		748 1 804	QUIKRLPT	06,2146		132 1 133	RATEDEN	16,3464		952
P65	26,2440		749 1 815	QUITBIT	4706	=	61	RATEFILT	21,2174		972 1 972
P65.1	26,2456		749 2 209 749	QUITFLAG	0221	=	61 4 259 1288	RATEINDX	1130		75 6 179 986
P66	26,2473		750 1 820	Q19	26,3327	=	831 1 809	RATELIM	16,3520		952 1 950
P66END	26,2502		751 1 750	Q2	E7,1711	=	116 3 116 810	RATENUM	16,3500		952
P67	26,2477		751 1 821	Q21	26,3177		831 1 796	RATEZRO	20,2003		674
P67.1	26,2511		751 3 208 826	Q22	26,3201		831 1 796	RATT	0000	=	1318 37 448 1295
P67.2	26,2530		753 1 826	Q3	26,3167		830 1 810	RATT1	0016	=	1318 6 480 886
P67.2CAD	25,3623		826 1 826	Q5	26,3171		830 1 811	RAXERR	E6,1573	=	110 1 1045
P67.3	26,2540		753	Q6	26,3173		831 1 811	RBDFAIL	E6,1627	=	106 10 106 1026
P74	35,2002		453 1 199	Q611	E7,1704	=	122 4 122 584	RBFAIL	17,3102		1013 1 1013
P75	35,2157		458 1 199	Q6111	E7,1705	=	122 6 122 585	RBLAST	17,3343		1021 2 1021
P76	13,2036		500 1 199	Q7	E6,1574	=	113 11 274 818	RBLASTOK	17,3371		1021 1 1021
P76LOC	13,2000	=	27 1 500	Q7F	26,3175		831 3 796 818	RBYPASS	17,3545		1025 1 1021
P76SUB1	13,2165		502 1 501	Q7FKOMIN	26,3165		830 1 820	RCFAIL	17,3016		1011 1 1011

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RCL	1222	= 77	1 77	RECRATIO	13,3756	1318	1 1308	REG4TST	16,3424		951
RCLL	E7,1656	= 118	2 118 613	RECT.1	31,2767	619	1 612	REG5TST	16,3433		951
RCLP	E7,1530	= 118	9 118 595	RECT.2	31,2776	619	1 619	REINIT	21,2520		980 3 972 993
RCM	0002	= 885	4 884 885	RECT.3	31,3001	619	1 619	REINTBIT	4704	= 63	2 1290
RCNORM	E5,1654	= 93	4 93 1248	RECT.4	31,3005	619	1 619	REINTFLG	0236	= 63	5 501 1467
RCON	E7,1635	= 124	12 124 880	RECT.5	31,3007	619	1 619	REJECT2	07,2314	223	1 223
RCSADDR	21,2005	689	1 689	RECTEST	11,3206	1308	3 1308 1309	REJECT3	07,2325	224	1 224
RCSADDR4	04,2400	199		RECTIFY	11,3344	1311	8 1226 1309	RELDELV	E5,1636	= 91	6 91 546
RCSATT	21,2106	970	5 199 1027	RECTOUT	13,3157	1286	2 1286 1287	RELDSP	4473	374	8 193 369
RCSCADR	24,3702	688		RECYCLE	04,3203	516	1 518	RELDSPON	4410	371	3 308 374
RCSDAPON	21,2010	689	6 193 689	REDAP	21,2532	982	1 971	RELDSP1	4516	375	2 348 360
RCSDAPUP	42,3537	687	2 687	REDC	33,2002	413	1 240	RELDSP2	4507	375	2 375
RCSFLAGS	E6,1501	99	51 407 1034	REDOCTR	1154	75	4 167 181	RELINTQ	10,3357	1442	2 1438 1442
RCSINIT	21,2611	983	1 983	REDOEXTP	35,3426	498	1 494	RELINUS	27,2074	382	1 205
RCSINITB	21,2612	983	1 983	REDOMANC	27,2023	381	1 381	RELOADSV	11,3545	1314	1 1313
RCSLOC	21,2104	970	1 970	REDOMANN	27,2002	381		RELRET	0144	= 67	4 375
RCSSWIT	21,2603	983	1 983	REDOMASK	10,3632	1447	2 1432	RELTAB	4072	128	4 130 353
RCSUP	21,2000	688	1 688	REDOPCSE	37,3651	838	1 839	RELTAB11	4105	128	3 129 1171
RCS2CADR	17,3624	1027	1 1027	REDOPRIO	10,2670	1434	1 1447	RELV8IT	4702	= 55	
RCV	E3,1534	= 82	27 82 1311	REDORCS	21,2071	970	1 187	RELVELSW	0140	= 55	3 799 802
RCVCSM	E3,1606	83	3 572 619	REDOR22	27,2377	574	1 206	REM	26,2162	738	1 737
RCVLEM	E3,1660	83	1 572	REDOSAT	23,2765	537	2 187 537	REMA	26,2165	738	1 738
RD	E7,1663	= 124	6 124 862	REDOTVC	16,3165	914	1 187	RENDEZ	37,2000	= 31	1 560
RDAPEND	16,3711	955		REDO4C.9	16,2362	678	1 205	RENDEZVU	0002	= 202	17 201 202
RDCDUS	15,2236	714	1 713	REDO5.31	37,2614	774	1 211	RENDGUID	23,2000	= 28	
RDE	13,3764	1318	1 1305	REDO5.5	37,2660	775	1 210	RENDISP	34,3142	572	2 570 571
RDESIRED	E5,1757	= 93	5 93 1268	REENTRY	25,2000	= 29	2 795 804	RENDISP2	34,3173	573	1 573
RDFAIL	17,3104	1013	1 1013	REENTRY1	26,2000	= 29	2 802 830	RENDISP3	34,3202	573	2 573
RDLONGR	40,2673	330	1 330	REFAZE10	25,2120	798	1 749	RENDISP4	34,3215	573	
RDM	13,3762	1318		REFLASH	10,2610	1432	2 639 640	RENDISP7	34,3163	573	1 573
RDOT	E7,1677	= 116	17 116 823	REFLASHR	10,2613	1432		RENDNOD	04,2211	196	1 195
RDOTREF	1155	= 76	5 76 817	REFLECT	15,3367	1050	1 1050	RENDVOD	04,2204	195	1 195
RDRPTBB	4061	127	1 127	REFSMBIT	4676	= 49		RENDWBIT	4712	= 54	
RDSP	E5,1444	= 96		REFSMFLG	0057	= 48	7 471 721	RENDWFLG	0131	= 54	12 203 1314
READACCS	37,2653	775	4 528 784	REFSMMAT	E3,1735	83	35 166 884	REND1	34,2523	567	3 572 575
READCDUK	22,2376	396	2 385 390	REFTEST	35,3675	627	1 626	REND1A	34,2527	567	2 568
READGYMB	15,2454	1031	3 212 1036	REGIONG	16,3434	951		REND1C	34,2713	569	2 572
READGYM1	15,2467	1031	1 1031	REGODSP	10,2616	1433	1 658	REND1CA	34,2752	570	2 570
READLC	40,2653	330	4 330 332	REGODSPR	10,2621	1433	2 529 825	REND12	34,3007	571	2 570 573
READLC1	40,2664	330	1 330	REGR21	43,2625	250	1 250	REND13	34,3024	571	1 572
READPIPS	22,3524	1472		REGSLEEP	07,3174	1395	1 1395	REND14	34,3046	571	1 569
RECALTST	40,3450	368	2 337 358	REGUP	6202	1080	3 1080	REND14A	34,3072	572	1 572
RECAL1	40,3453	368	1 368	REG1TST	16,3370	950		REND15	34,3077	572	1 569
RECAL2	40,3464	368	2 369	REG2TST	16,3420	950		REND16	34,3104	572	1 571
RECAL3	40,3476	369		REG3TST	16,3376	950		REND17	34,3112	572	1 571

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REND18	34,3120	572	1 571	RESETPRF	43,3016	257	1 230	RM	E7,1703	= 122	3 122 576
REND2	34,2537	567	1 567	RESETVHF	43,3025	257	1 230	RMAG	E3,1765	84	1 84
REND3	34,2557	568	3 569 573	RESETX2	12,3123	1261	1 1259	RMAG1	0014	= 1337	4 1340 1349
REND3A	34,2556	568	1 567	RESIGN	35,2451	462	1 462	RMANNDX	E6,1656	= 107	6 107 993
REND4	34,2601	568	1 567	RESQ	E4,1532	= 85	3 86 738	RMAX	E4,1402	85	1 570
REND5	34,2615	568	1 571	RESQ	37,3367	787	1 786	RME	04,2535	202	1 1288
REND5A	34,2621	568	1 568	REST	10,3373	1443	1 1440	RMM	04,2533	202	
REND6	34,2645	569	1 568	RESTAIER	33,3277	436	1 211	RN	1170	76	18 166 1292
REND7	34,2653	569	1 571	RESTARPT	E5,1577	= 96	2 427	RND/TST	42,3456	345	3 344 345
REND8	34,2670	569	1 569	RESTART	01,2000	= 25	4 205 1382	RNDCON	42,3215	332	2 333
REND9	34,2673	569	1 569	RESTARTS	01,3520	1378	1 184	RNDREFDR	07,2777	1390	3 147 1410
REND9A	34,2703	569	1 569	RESTEST1	33,3320	436	1 210	RNDVZBIT	4704	= 44	
REPCHEK	16,2761	903	1 902	RESTEST3	33,3331	436	1 211	RNDVZFLG	0010	= 44	5 252 1410
REPETE	35,2425	461	1 461	RESTREG	0366	71	4 179 1439	RNGETEST	36,2432	545	1 542
REPFRAC	E6,1652	= 102	5 102 903	RESTSLEP	10,3377	1443	1 1443	RNGSCFLG	0120	= 53	3 53 607
REPIP1	31,3201	784	1 785	RESTSRF	43,3205	260	1 229	RNRAD	0046	= 36	1 576
REPIP3	37,3207	784	1 785	RESULTCT	E5,1547	= 96	5 416 420	RN1	1231	= 76	9 32 1295
REPLACE	17,3710	1029	2 1029	RESUME	5222	1199	50 127 1414	ROLL/PIP	E6,1672	= 108	3 108 837
REPLACEP	17,3733	1030		RETARG	33,3646	444	1 444	ROLL/180	E6,1664	= 108	11 108 1048
REPLACER	17,3727	1030	3 1029 1030	RETARG1	33,3667	444	1 444	ROLLC	E6,1715	= 108	14 109 1049
REPLACEY	17,3742	1030		RETLOCN	E4,1721	= 125	5 889 891	ROLLDAP	16,3312	949	1 901
REPLACE1	17,3715	1029	2 1029	RETNOW	06,2266	137	1 138	ROLLDUMP	15,3661	1056	1 1056
REPLACE2	17,3722	1030	2 1029	RETRN1	26,2640	756	1 755	ROLLFIRE	E6,1611	= 101	7 101 956
REPOSADR	37,3676	839	1 838	RETRN2	26,2630	756	2 756	ROLLHOLD	E6,1717	= 109	3 109 1046
REP11	34,2247	528	1 206	RETRN3	26,2625	756	1 755	ROLLJETS	0006	= 38	5 1033 1056
REP11A	34,2026	525	2 206 528	REVCNT	6211	1080	2 1080 1171	ROLLOGIC	16,3333	949	2 949
REP11A-1	34,2025	524	1 526	REVERS	35,2454	462	1 462	ROLLON	16,3441	951	1 950
REP11A-2	34,2024	524	1 526	REVS	E6,1670	= 102	6 102 944	ROLLPREP	16,2670	901	
REP11S	34,2272	528	1 524	REVUP	20,3535	944	2 944	ROLLSET	16,3523	952	3 952
REP11SA	34,2274	529	2 524 528	REV37	04,2233	196	1 196	ROLLTIME	17,3323	1021	4 1012 1014
REQ	5530	1456	1 1456	RGEXIT	E4,1770	= 89	3 89 624	ROLLTM	E6,1714	= 108	3 108 1042
REQADC	41,2064	317	1 317	RHC	E6,1635	= 106	4 106 983	ROLLWORD	E6,1612	= 101	9 101 955
REQCOM	41,2307	321	2 321	RHCSB	E4,1720	= 87	4 87 885	RONE	E4,1726	= 87	17 87 1346
REQDATX	41,2302	321	3 335 336	RHC1	E6,1636	= 106	4 106 983	ROO	04,2127	194	
REQDATY	41,2304	321	3 335 337	RHC2	E6,1637	= 106	4 106 983	ROOAD	04,2377	199	1 194
REQDATZ	41,2306	321	3 317 337	RIGHT	00,2236	1126	1 1128	ROOTMU	0020	= 1271	3 1248 1267
REQEXLOC	41,2207	319		RIGHT-	00,2332	1128	1 1125	ROOTOPOO	04,2030	192	1 192
REQEX1	41,3463	358	1 358	RIGHTGTS	33,2550	427	1 427	ROOTRET	1076	74	1 74
REQMM	41,3442	357	1 357	RIGHTR	00,2031	1119	1 1127	ROPECHK	43,3515	1364	1 1361
REQRET	1013	73	17 187 366	RIGHTS	4336	370	2 338 339	ROTA	26,2057	730	2 729
REQUESTC	41,3467	358	1 358	RINDEX	E6,1517	= 105	4 105 1013	ROT180	27,2266	387	1 387
REREADAC	37,3214	784	3 210	RINIT	E7,1567	= 119	13 119 665	ROUND	00,2116	1121	1 1085
RES	26,2143	738	2 737 738	RL	E7,1664	= 118	2 118 613	ROUNDSUB	7105	1104	4 1116 1127
RESA	26,2161	738	1 737	RLS	E4,1425	85	10 174 1282	ROWDOT	30,3606	602	3 599 601
RESCHNG	33,3354	437	1 211	RLTST	34,2473	535	1 532	ROWDOT1	30,3617	602	1 603

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SYMBOL	DEF	H	REFERENCES	SYMBOL	DEF	H	REFERENCES	SYMBOL	DEF	H	REFERENCES
ROWDOT2	30,3636		603 2 603	RTARG1	E7,1603	= 119	12 119 481	RTHETA	E4,1724	= 87	12 87 622
ROWDOT3	30,3640		603 1 602	RTB	01,2475	1162	1 1162	RTIG	E7,1631	= 120	12 120 669
RP-TO-R	26,3341		1210 9 556 1283	RTB/8HIZ	01,2474	1162	1 1084	RTINIT	E7,1451	= 115	10 115 833
RPAD	22,3310		486 5 487 1352	RTBCODES	22,2000	= 28	1 1472	RTMU	E7,1747	= 123	2 123 484
RPADTEM	E4,1722	= 88	6 88 512	RTBCODE1	22,2000	= 28		RTMURTE	35,3767	883	1 869
RPAD1	22,3310	= 1352		RTE	32,2000	= 30	1 849	RTNAPSE	E5,1712	= 93	3 1269 1270
RPASS3	E7,1553	= 119	10 119 541	RTEALRM	36,2772	845	3 842 856	RTNLAMB	E5,1712	= 93	9 93 1267
RPASS36	E4,1726	= 88	5 88 492	RTEAST	E7,1457	= 115	3 115 287	RTNORM	E7,1465	= 115	3 115 287
RPASS4	E7,1631	= 120	4 120 546	RTECON	34,2000	= 30	1 881	RTNPRM	E5,1755	= 93	3 93 1257
RPER	0016	= 1343	3 511 1343	RTECON1	35,2000	= 30	1 882	RTNSAVER	0145	= 68	3 1333 1335
RPPREC	E7,1617	= 120	2 459 462	RTEDISP	32,2305	852	1 845	RTNTR	E5,1712	= 93	1 1268
RPQFLAG	0170	= 58	6 1285 1309	RTEDVC	E7,1631	= 124	8 124 876	RTNTT	E5,1712	= 93	5 1256
RPQFLBIT	4674	= 58		RTEDI	1351	80	1 843	RTORPA	26,3410	1212	1 1212
RPQV	E4,1662	= 86	8 86 1309	RTEGAM2D	E7,1633	= 124	5 124 843	RTORPB	26,3377	1212	1 1212
RPRE	0030	= 124	7 858 862	RTENCKEX	E7,1733	= 124	11 124 866	RTRIAL	26,3017	762	1 759
RPRE,	E7,1667	= 124	5 124 862	RTENCK1	32,3051	865	1 847	RTRN	E4,1767	= 89	13 89 548
RPREXIT	0050	= 1218	3 1210 1212	RTENCK2	32,3061	865	1 861	RTRNCADR	01,3557	1379	5 1378 1383
RPRPXXXX	26,3404	1212	1 1210	RTENCK3	32,3077	865	1 858	RTRNMU	04,2740	484	1 484
RPSTART	E6,1702	= 112	2 112 530	RTENCK3A	32,3102	865		RTSR1/MU	E7,1751	= 123	2 123 484
RPSV	E4,1677	= 86	5 86 1302	RTENCK3B	32,3105	865	1 865	RTX1	E7,1745	= 123	11 123 1295
RPTCLONG	30,3762	891	1 886	RTENCK3D	32,3113	865	1 865	RTX2	E7,1746	= 123	15 123 1295
RPTORA	26,3356	1210	1 1210	RTERM	0022	= 1337	5 760 1348	RT23	31,2000	= 30	1 608
RPTORB	26,3350	1210	1 1211	RTEVN	36,2776	845	2 844 845	RT53	14,2000	= 27	2 620 723
RPVAR	E4,1407	85	1 591	RTE1	36,2000	= 30	1 840	RUN	E5,1427	95	4 440
RQVV	E4,1671	= 86	6 86 1302	RTE299	36,2517	841		RUPTAGN	0734	71	5 71 1199
RRATE	E4,1722	= 87	7 87 622	RTE32C	36,2556	842		RUPTREG1	0070	65	40 128 1452
RRCSML	31,3533	891	4 886 891	RTE34C	36,2570	842	1 842	RUPTREG2	0071	65	19 135 1405
RRECT	E3,1502	= 82	14 82 1311	RTE350	36,2600	842	1 842	RUPTREG3	0072	65	10 413 1437
RRECTCSM	E3,1554	83	9 83 1283	RTE360	36,2603	842	4 842 844	RUPTREG4	0073	65	7 65 1413
RRECTHIS	E3,1554	= 83	6 257 1280	RTE367	36,2610	842	1 842	RUPTSTCR	0063	= 65	
RRECTLEM	E3,1626	83	3 83 1282	RTE369	36,2627	843	1 843	RUTMXTAB	42,3047	276	1 263
RRECTOTH	E3,1626	= 83	2 258 259	RTE372	36,2651	843	1 843	RUTMXTEM	0153	68	2 263 338
RRECT1	0022	= 82		RTE373	36,2653	843	1 843	RVAR	E6,1402	98	1 572
RREL	E6,1703	= 108	7 108 1058	RTE374	36,2672	843	1 843	RVARMIN	E6,1404	98	2 570
RSBBQ	E3,1432	81	3 167 181	RTE375	36,2677	844	1 843	RVCON	13,3220	1287	1 1286
RSP-RREC	E4,1755	= 88	3 168 633	RTE38C	36,2707	844	1 844	RVCS/RDS	34,3552	585	1 582
RSPHERE	13,3760	1318	2 1308 1309	RTE385	36,2730	844	1 844	RVEC	E5,1656	= 93	13 454 1269
RSTGTS1	33,2456	425	1 210	RTE390	36,2732	844	1 844	RVQ	00,3274	1149	1 1085
RSTPAF	34,3623	606		RTE505	36,2751	844		RVSW	0157	= 57	8 454 1256
RSTRTST	20,2067	683		RTE510	36,2764	845	2 845	RVSWBIT	4702	= 57	
RSUBE	15,2161	702	1 701	RTE515	36,2766	845	1 845	RWORD	17,2776	1011	
RSUBM	15,2157	702	1 702	RTE625	36,2770	845		RWORD1	E6,1451	99	12 99 1029
RT	E7,1473	= 115	6 115 800	RTGO	E7,1713	= 116	6 116 761	RWORD2	E6,1452	= 99	7 99 1030
RTABLE	17,3157	1015	4 1011 1025	RTGON64	E7,1713	= 116	1 274	RXLNS	17,3024	1011	2 1011
RTARG	E7,1414	= 114	10 114 847	RTGON67	E7,1713	= 117	2 274 800	RZC	E7,1626	= 118	6 118 619

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RZXLNS	17,3106		1013 2 1013	R300K	27,3331		1352	R53FLAG	0011	=	44 2 696 723
RO2	07,2000	=	26 1 1407	R31	35,2000	=	30 1 494	R53FLBIT	4705	=	44
RO2BOTH	07,3573		1407 8 550 884	R31CALL	35,3150		494 1 248	R53JOB	14,2144		698 1 698
RO2ZERO	07,3607		1408 2 719 1407	R31FLAG	0222	=	61 1 495	R53OUT	14,3406		724
R1	0040	=	1272 16 858 1270	R31FLBIT	4707	=	61	R53Z	14,3376		724 1 724
R1A	E5,1743	=	93 14 93 1270	R34	31,2000	=	30 1 498	R54	14,2707	=	711 1 709
R1D1	4333		370 14 226 1145	R34ANG	35,3232		495 1 499	R55	15,2203		711 1 709
R1SAVE	1073		74 4 187 1444	R34LOS	31,2000		498 1 495	R55.1	15,2210		711
R1VEC	E5,1656	=	93 6 93 1263	R35	31,2000	=	30 2 886 891	R55.2	15,2216		711 1 711
R2	E5,1721	=	93 3 1254	R35A	30,2000	=	29 1 891	R55COR	15,2235		711 1 711
R2D1	4334		370 7 313 1171	R36	04,2746		492 2 259 493	R55RET	15,2231		711 1 711
R2VEC	E5,1664	=	93 10 93 1263	R36INT	04,2766		492 1 493	R56	15,2252		732 2 710 720
R21BIT	4675	=	46	R36LM	04,2000	=	25 1 491	R56A	15,2261		732 3 732 733
R21CSM	37,2445		560 1 250	R36TAG2	04,3055		493 1 493	R56B	15,2336		733 2 733
R21CSMA	37,2516		561 2 561	R40ENABL	24,3427		661 1 207	R57	37,2360		558 2 609 611
R21CSM1	37,2523		561	R51	14,2523		708 2 208 693	R57A	37,2372		558 1 559
R21C1	37,2510		561 2 560 561	R51.2	14,2527		708	R57B	37,2416		559 1 559
R21END	37,2527		561 4 560 561	R51.3	14,2530		708 1 710	R57BIT	4703	=	55
R21MARK	0037	=	46 3 194 561	R51.4	14,2664		710 1 709	R57FLAG	0141	=	55 4 608 611
R22	34,2512		567 2 206 551	R51A	14,2602		709 1 710	R60ADRS	31,3063		620 1 610
R22ALARM	43,2632		250 2 250	R51B	14,2677		710 1 709	R60CALL	31,2214		611 1 620
R22CABIT	4704	=	61	R51K	14,2650		709 1 709	R60CSM	27,2000		381 5 389 637
R22CAFLG	0217	=	61	R51ST	14,2571		708 2 708	R60FLAG	0126	=	53 2 552
R22S1	27,2000	=	29 1 574	R52	14,2002		696 4 552 709	R60FLBIT	4707	=	53
R23.END	31,2526		615	R52A	14,2017		696	R61CNTR	E6,1775	=	112 6 113 574
R23.0	31,2305		612 1 612	R52C	14,2026		696 1 697	R61CSM	37,2536		562 2 552 697
R23.05	31,2307		612 2 612	R52D	14,2031		696 1 697	R61C1	37,2556		562
R23.1	31,2315		612 1 612	R52E	14,2052		696 2 696	R61END	37,2574		563 1 562
R23.2	31,2323		612 1 612	R52F	14,2065		697 6 697 698	R61TEST	27,2114		383 1 381
R23.3	31,2341		612 1 612	R52H	14,2103		697 1 696	R62DISP	27,2330		389 2 245 389
R23.4	31,2353		612 1 612	R52HA	14,2104		697 1 697	R63	34,3463		584 2 581 607
R23.5	31,2355		613 1 612	R52I	14,2116		697	R63COMP	34,3463	=	607 1 606
R23.51	31,2454		615 1 615	R52J	14,2124		697 2 696 698	==========			
R23.52	31,2476		615 1 615	R52JA	14,2037		696 1 697	S(XI)	0032	=	1272 6 1248 1254
R23.53	31,2504		615 1 615	R52L	14,2161		698 1 696	S+ZERO	4714	=	1359 9 256 1365
R23.55	31,2364		614 1 611	R52M	14,2131		697 1 696	S+1	4712	=	1359 9 256 1367
R23.6	31,2506		615 1 615	R52Q	14,2100		697 1 697	S+2	4711	=	1359
R23.7	31,2521		615 1 615	R52SYNC	14,2122		697 1 697	S+3	6214	=	1359
R23.8	31,2522		615	R52VRB	14,2005		696 1 699	S+4	4710	=	1359
R23BIT	4702	=	45	R53	14,3327		723 3 609 720	S+5	4715	=	1359
R23CSM	37,2447		560 1 250	R53A	14,3333		723 1 724	S+6	6211	=	1360
R23CSM1	37,2464		561 1 561	R53B	14,3355		724 1 723	S+7	4716	=	1360 1 1361
R23FLG	0025	=	45 3 250 569	R53C	14,3365		724 2 724	S-ZERO	4713	=	1360 1 1364
R3D1	4335		370 5 313 367	R53D	14,3405		724 2 724	S-1	7716	=	1360 2 1366 1367
R30LOC	23,2000	=	28 1 504	R53EXIT	E7,1501	=	114 3 114 724	S-2	7715	=	1360

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SYMBOL	DEF	H	REFERENCES	SYMBOL	DEF	H	REFERENCES	SYMBOL	DEF	H	REFERENCES
S-3	7714	= 1360		SCALEPOP	25,2115	798	1 796	SETBIT	10,2175	164	1 161
S-4	6061	= 1360		SCALPREP	26,3714	1411	2 1410 1411	SETCLOCK	24,3211	656	
S-7	5630	= 1360	1 1361	SCALSAVE	1152	75	3 1410 1411	SETCNT	06,3153	158	1 156
SAC	E5,1773	= 92	11 92 733	SCAXIS	E6,1750	= 111	16 111 669	SETCOARS	07,2746	1390	3 142 1387
SALFA	E6,1507	= 109	7 109 1046	SCHZEROS	33,3112	433	5 421 436	SETDESMD	06,3154	158	11 156 158
SAMEJETS	16,3637	954		SCOUNT	1366	= 79	4 79 1364	SETEBANK	4327	370	2 320 330
SAMPTIME	0013	= 36	5 218 372	SCOUTEND	40,2606	329	4 329	SETGAMMA	13,2523	1208	2 1203 1205
SATCLEAR	34,2424	534	1 530	SCTVAR	30,3647	603	2 591 594	SETGLOCK	06,2460	143	4 142 143
SATOUT	34,2416	534	1 531	SD	22,2370	396		SETGMEX	13,2531	1208	1 1208
SATRATE	23,3037	538	3 537 538	SDISPLAY	43,2762	256	1 1367	SETGWLST	33,2532	427	1 427
SATRLRT	E6,1700	= 111	5 112 535	SECAD	22,2016	390		SETIFLGS	13,2621	1280	3 203 1292
SATSTICK	23,3006	537	1 538	SECMAX	E7,1453	= 119	6 119 461	SETINTG	27,2343	574	6 551 612
SATSTKON	43,3210	536	1 687	SECON1	42,3202	331	1 333	SETISSW	06,2665	152	7 138 1393
SAVBNK	E6,1771	= 112	3 112 563	SECON2	42,3204	331	1 331	SETJ=2A	30,3566	602	1 602
SAVE	E5,1474	= 95		SEC1THET	36,2012	539	1 542	SETJTAG	15,3222	1048	2 205 776
SAVECBIT	4701	= 61		SEC2THET	36,2014	540	1 542	SETLOC	01,2704	1179	3 1179 1183
SAVECFLG	0214	= 61	3 609 611	SEC24.96	24,2340	642	1 646	SETMARK	10,2654	1433	
SAVEDCDU	E6,1772	= 112	6 112 584	SEC29.96	24,2341	642	3 639 642	SETMAXDB	24,2227	640	2 198 651
SAVEDEN	27,3076	1347	1 1347	SELECTMU	04,2716	484	4 453 519	SETMAXER	04,2331	198	1 197
SAVEFLAG	1071	= 1447		SELFADRS	43,3242	1360	2 256	SETMGA	04,2670	483	1 483
SAVELOCR	10,3055	1437	1 1436	SELFBANK	01,3241	1187	1 1187	SETMIND	26,3132	802	1 799
SAVELOCS	10,3050	1437	2 1433 1436	SELFCHEC	43,2000	= 31	1 1359	SETMINDB	24,2213	640	3 198 640
SAVENDX	15,3732	1058	1 1058	SELFCHK	43,3333	1361	5 187 1361	SETMCDN	13,2673	1281	3 1281 1310
SAVEPOS	E7,1706	= 122	5 122 584	SELFERAS	1357	79	2 79 80	SETMUER	04,2727	484	1 484
SAVEVEL	E7,1714	= 122	3 123 584	SELFRET	1361	= 79	7 79 1361	SETNADD	4325	370	2 317 339
SAVQR52	E5,1576	= 90	4 90 699	SELFSUPR	40,2000	= 31		SETNBPOS	33,3432	440	1 415
SAX	E5,1757	= 92	3 705 706	SENDID	05,3576	1068	2 1064 1068	SETNCADR	4317	370	7 317 370
SBAND	42,2000	= 31	1 884	SENDOGMD	10,2171	164	1 163	SETNORM	10,2662	1434	1 1432
SBANDANT	42,3565	884	2 243 885	SENDPLLS	07,2735	1389	1 1388	SETOFF	06,3240	160	1 160
SBIT1	4712	= 1359		SEPMIN	42,3350	334	2 331 333	SETOVF	6752	1099	1 1102
SBIT10	4701	= 1359		SEPMNRET	0144	= 67	2 334	SETOVF2	7121	1104	1 1100
SBIT11	4700	= 1359	2 1365 1366	SEPSCRET	0144	= 67	2 333	SETPAF	34,3647	607	1 606
SBIT12	4677	= 1359	1 1365	SEPSEC	42,3317	333	1 332	SETPD	7562	1116	1 1083
SBIT13	4676	= 1359		SEPSECNR	42,3332	333	3 331 333	SETPRFLG	43,3013	257	1 230
SBIT14	4675	= 1359		SEPSEC1	42,3325	333	1 333	SETPRIO	10,2636	1433	
SBIT15	4674	= 1359	1 1366	SERVCADR	24,2406	643	1 640	SETRAD	22,3340	487	1 486
SBIT2	4711	= 1359		SERVCAD1	26,2641	756	2 753 755	SETRADX	22,3353	487	1 487
SBIT3	4710	= 1359		SERVCAD2	26,2641	= 753	1 751	SETRE	13,2533	1209	3 590 1205
SBIT4	4707	= 1359	1 1363	SERVEXIT	37,3136	781	5 529 825	SETREX	0051	= 1209	2 1209
SBIT5	4706	= 1359		SERVICER	37,3013	779	2 210 776	SETROUND	00,2272	1126	3 1126
SBIT6	4705	= 1359		SERVICES	37,2000	= 31	1 773	SETRXX	13,2546	1209	3 1209
SBIT7	4704	= 1359	1 1366	SERVNOUT	25,3603	825	2 753 796	SETSAMP	06,3022	155	1 155
SBIT8	4703	= 1359		SERVXT	24,3131	654	4 642 655	SETSURF	43,3202	260	1 229
SBIT9	4702	= 1359	1 1363	SETAUG	40,2550	328	1 328	SETT86	24,3231	656	2 656
SBNK03	4755	= 1360	1 1365	SETBANK	13,3015	1283	4 1281 1282	SETTIME4	06,2074	130	1 132

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SYMBOL	DEF	H	REFERENCES	SYMBOL	DEF	H	REFERENCES	SYMBOL	DEF	H	REFERENCES
SETT5	21,2144	971	2 970 971	SHIFTA	27,2537	576	1 576	SIZETAB	01,2000	205	2 1381 1383
SETUP.9	24,3053	653	1 652	SHIFTNDX	27,2526	576	4 568 571	SIZETST	42,3474	345	2 344 345
SETUPDSP	10,2344	1368	1 1368	SHIFTR1	22,3422	490	6 455 630	SKEEP1	1371	= 79	20 79 1367
SETUPDYN	24,3234	656	1 656	SHOLTS	41,3647	378	1 377	SKEEP2	1372	= 79	10 79 1365
SETUPER1	33,3050	432	1 432	SHORTMP	7256	1108	9 278 1412	SKEEP3	1373	= 79	14 79 1366
SETUPGC	33,3156	434		SHORTMP2	7262	1108		SKEEP4	1374	= 79	14 79 1367
SETVAC	41,3500	358	1 358	SHORTT	00,2017	1119	2 1082	SKEEP5	1375	= 79	10 79 1366
SETVANDI	30,2357	589	1 588	SHORTV	00,2121	1122	1 1082	SKEEP6	1376	= 79	6 79 1367
SETVHFLG	43,3021	257	1 230	SHOW	33,2427	422	3 416 418	SKEEP7	1377	= 79	22 181 1366
SETWBODY	21,2741	986	1 987	SHOWSUM	43,2751	256	1 256	SKIPADD	10,3076	1438	1 1438
SETWIN=0	30,3543	601	1 601	SHOW1	33,2431	422	1 422	SKIPSIM	05,2356	178	1 178
SETWD	05,3405	1064	3 1064 1066	SIDETRAK	25,2710	812		SKIPTPER	23,2744	512	1 512
SETWHSD	30,2332	588	1 588	SIDLOCP	43,3264	1360	1 1361	SLAP1	05,2347	178	1 319
SETXTACT	43,2105	230	1 231	SIGHTSIX	6211	= 724	2 724 734	SLEEPIE	33,2522	427	5 425 437
SETZOENC	06,3157	158	1 156	SIGN	7624	1118	1 1083	SLEFT5	4354	371	1 354
SET1/PDT	14,3270	721	2 714 719	SIGNCK1	21,3456	998	1 998	SLOAD	6450	1091	1 1083
SEUDOPOO	04,2165	195	1 196	SIGNCK2	21,3547	999	1 999	SLOAD2	6024	1074	5 1091 1478
SEVEN	4716	1167	24 128 1449	SIGNCK3	21,3600	1000	1 1000	SLOPE	E6,1654	= 107	4 107 999
SFAIL	1357	= 79	4 79 1361	SIGNCK4	21,3635	1000	1 1000	SLOPEBIT	4710	= 46	
SFCOM	42,2124	264	1 264	SIGNCK5	21,3663	1001	1 1001	SLOPEHI	00,2314	1127	1 1152
SFCONST1	E5,1477	= 95		SIGNFIX	40,2735	341	2 341	SLOPELO	00,3007	1141	1 1153
SFCONUM	41,3042	338	2 326 340	SIGNMPAC	22,3707	1478	16 392 1349	SLOPESW	0033	= 46	2 1252 1263
SFINTAB	42,2443	270	1 264	SIGNRET	0125	= 66		SLOPEVAL	05,3315	912	1 910
SFINTABR	41,3203	340	1 340	SIGNTEST	40,2347	313	2 312	SLOPE2	21,3424	998	2 1000 1001
SFOUTAB	42,2513	271	1 264	SIM2CADR	05,2354	178		SMALL	00,3133	1145	1 1142
SFOUTABR	41,2575	327	1 327	SINB	E5,1675	= 92		SMALLMP	21,2026	967	3 973 1003
SFRET	41,3057	338		SINBLANK	40,2473	315	1 315	SMALL2	00,3062	1142	1 1145
SFRET1	41,3041	338		SINCDU	0736	= 71	6 71 1335	SMCDURES	23,3675	1336	1 583
SFRUTMIX	41,3027	338	4 320 340	SINCDUX	0742	= 71	6 533 927	SMODE	1362	= 79	7 79 1361
SFRUTNOR	41,3021	338	4 326 340	SINCDUY	0736	= 71	5 715 1336	SMODECHK	43,3276	1361	3 1361 1364
SFTEMP1	0123	= 66	20 264 343	SINCDUZ	0740	= 71	4 533 1336	SMPAC+	00,3404	1152	3 1151
SFTEMP2	0124	= 66	2 343	SINE	00,3527	1154	2 1085 1330	SNAPAGN	05,3456	1065	
SGNAGREE	22,3541	1472	4 417 1288	SINESLOC	23,3670	1335	1 1334	SNAPEND	05,3475	1066	
SGNCHECK	12,2567	1252	2 1252 1253	SINGIMLC	27,2313	387	1 385	SNAPLOOP	05,3445	1065	1 1065
SGNCOM	40,2323	312	1 313	SINI	26,3635	1218	2 1214	SNGLCD	22,2374	396	
SGNDVCVF	00,2402	1129	1 1129	SINM	E6,1510	= 109	2 109 1039	SNTH	E5,1731	= 93	18 93 1269
SGNOFF	0123	= 66	3 312 313	SINNDI	0010	= 1218	1 1214	SN1	00,3552	1155	1 1154
SGNON	0122	= 66	3 312 313	SINO	E6,1512	= 109	3 109 1038	SOB	0042	= 1218	4 1213 1214
SGNROOT	E5,1756	= 93	4 93 1268	SINOOSM	E6,1514	= 109	3 109 1039	SOLNSBIT	4710	= 54	
SGNRT	E6,1676	= 102	3 102 950	SINTH	0022	= 70	19 280 1324	SOLNSW	0127	= 53	4 1266 1269
SGNTAB	40,2344	313	2 312 313	SINVEC1	27,2315	387	1 385	SOLPOS	26,2123	738	
SGNTO1	40,2753	342	1 341	SINVEC2	27,2317	387	1 386	SOMEERRR	33,3101	433	
SGNTST1	40,2363	313	3 313	SIN33	14,2501	707	1 705	SOMERR2	33,3104	433	2 419 437
SHAFTA	1161	= 95		SIX	6211	= 1171	42 142 1445	SOPT	43,3702	1367	1 1367
SHAXIS	14,2153	698		SIXTY	43,3233	1360	1 1366	SOPTION	43,3665	1366	2 1365

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SYMBOL	DEF	H	REFERENCES	SYMBOL	DEF	H	REFERENCES	SYMBOL	DEF	H	REFERENCES
SOPTICNS	43,3307		1361 2 1361	SQRTNP2	00,3474		1153 1 1153	STATEST	35,3204	=	32
SOPTICN1	43,3317		1361 1 1361	SQRTNCRM	00,3501		1153 1 1153	STATEUP	13,2000		202 1 1280
SOPTICN2	43,3320		1361	SQRTSHFT	00,3221		1148 1 1148	STATEXIT	E4,1674	=	86 3 497 498
SOPTICN3	43,3321		1361	SQRTSUB	00,3343		1151 3 1142 1156	STATEXTP	35,3312		497 1 494
SOPTICN4	43,3322		1361	SR	0021	=	36 35 260 1381	STATINT1	13,2570		1279 2 206 1279
SOPTICN5	43,3323		1361	SRDDV	00,2024		1119 1 1142	STATQUC	04,2236		196 1 196
SOPTICN6	43,3324		1361	SRRETURN	E7,1672	=	118 2 616 618	STBLEORB	04,2000	=	25 1 515
SOPTICN7	43,3325		1361	SRTEST	00,3455		1153 1 1152	STBYDUMP	15,2674		1040
SOPTON10	43,3326		1361	SR30.1	23,2667		511 2 506 508	STEERADS	24,2774		652 1 638
SOUPLY	33,3125		433	SR52.1	13,2176		727 1 696	STEERBIT	4700	=	47
SOURCBIT	4703	=	61	SR52/1	13,2000	=	27 1 727	STEERING	24,3121		654 1 652
SOURCFLG	0216	=	61 6 567 575	SR52E1	13,2312		728 1 728	STEEROFF	25,3605		826 1 821
SOUTHDR	E5,1431		95 3 95 417	SR52E2	13,2311		728 1 728	STEERSW	0042	=	47 4 660 675
SPARE	0007	=	165 22 166 174	SR52E22	13,2305		728 1 728	STEERULL	24,2650		649 1 649
SPBIT1	16,2131		672	SR52E3	13,2307		728 1 728	STEP2CK	34,3263		581 1 581
SPCOS	4767		1174 7 967 1331	SSP	6567		1093 1 1083	STEP3CK	34,3322		582 1 581
SPCOS1	4767	=	967 1 1005	STABLISH	43,2522		244 1 229	STICKCHK	21,3114		989 3 537 993
SPCOS2	4767	=	967 1 1005	STADR	6323		1086 1 1085	STIKBIT	4675	=	45
SPECSTS	33,2623		428 1 211	STALL	07,3517		1405 2 1404	STIKBITS	23,3043		538 2 537
SPECTEST	01,2674		1179 1 1183	STALTEM	0154	=	1291 3 1290	STIKFLAG	0020	=	44 2 194 243
SPITGYRO	33,3363		437	STAR	E5,1765	=	92 20 92 734	STKTEST	34,3311		582 1 581
SPLRET	23,2653		509 1 633	STARAD	E5,1735	=	92 24 92 1326	STOINST	05,3217		910 1 910
SPLRET1	23,2501		506 1 509	STARALGN	0736		71 2 71	STOPRATE	22,3245		409 5 183 409
SPNDX	E6,1506	=	105 34 105 1003	STARCODE	0735		71 9 274 734	STOPYZ	22,3256		409 1 409
SPNDXCHK	21,3007		987 2 987	STARIND	0304	=	69 19 201 735	STORCMD	10,2063		162 1 163
SPOLYARG	E6,1707	=	112 3 112 532	STARM	0040	=	70 4 278	STORDELT	35,2463		462 2 461 462
SPRTETIG	E7,1412	=	125 2 852 855	STARSAV1	E5,1610	=	90 7 90 728	STORE	6371		1088 6 1087
SPRTEX	E7,1762	=	124 14 124 863	STARSAV2	E5,1616	=	90 9 91 727	STORE,1	6363		1088 1 1087
SPSCODE	4702	=	1384	STARTAB	14,2000	=	27 1 1353	STORE,2	6366		1088 1 1087
SPSIN	4770		1174 8 967 1331	STARTEB	05,3154		188 1 185	STOREDTA	33,2553		427 2 427 429
SPSIN1	4770	=	967 1 1005	STARTENT	25,2000		795 1 746	STOREL/D	25,3520		823 1 815
SPSIN2	4770	=	967 1 1005	STARTEN1	25,2063		796 2 741 796	STOREMAX	12,2055		1244 3 1243 1244
SPSIX	31,3054		620 1 609	STARTMNV	27,2047		382	STOREPL	E5,1430		95 1 419
SPSOFF	24,2741		651 4 193 661	STARTPIP	33,2163		416 1 416	STORE1	6572		1093 1 1124
SPSOFF97	24,3455		661 1 209	STARTSB2	05,2760		185 1 183	STORHAPO	23,2716		511
SPSON	24,2564		648	STARTSIM	05,2352		178	STORHPER	23,2730		512
SPT	4773		1174 1 1174	STARTSTO	6403		1089	STORJUMP	6341		1087 1 1086
SPVAC	5053		1175 3 197 1436	STARTSUB	05,2750		184 3 178 184	STORLP71	27,3603		1469 2 1469
SPVACIN	5047		1175 1 1175	STARTSW	05,2351		178	STORT	34,3234		581
SPVQUIT	37,3420		833	STAR52	13,2245		727 1 727	STRAT	14,2441		706 1 706
SQ	1076	=	74 2 1174	STATE	0074		65 51 43 1407	STRATGY	14,2433		706 1 706
SQRARG	1077		74	STATEBIT	4706	=	49	STRKCALL	16,3041		904
SQRT	00,3207		1148 1 1085	STATEFLG	0067	=	49 7 574 1314	STRKNOW	16,3133		905 1 905
SQRTABRT	00,3402		1151 2 1151	STATEINT	13,2561		1279 3 206 1280	STRKTCPY	16,3137		905 2 905 917
SQRTNEG	00,3373		1151 1 1151	STATEND	13,2031		203 1 203	STRKTIME	E6,1664	=	102 5 102 906

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STRKTSTI	20,3431	942	1 244	SWRETLRN	4570	1070	9 216 1408	S22BX22A	30,3113	596	1 596
STRKTTMP	E6,1710	= 102	4 102 906	SWSAMPLE	1314	78	9 155 696	S22BX22B	30,3124	596	1 596
STRKUP	16,3125	905	2 903 917	SWSKIP	01,2624	1166	2 1166	S22BX44A	30,3163	596	1 596
STROKER	E6,1614	= 101	14 101 944	SWSTORE	01,2600	1165	2 1165	S22BX44B	30,3173	597	1 597
STRCKILL	20,3533	944	1 944	SWT/CCR	16,2750	902	2 902 917	S22C=I	30,2433	590	1 590
STROKON	43,2511	244	1 229	SWTCHCVR	16,2773	903	2 902	S22CALRC	30,3273	598	2 589 595
STRTGYRO	07,3207	1396	2 1394 1399	SWTCOPY	16,3027	903	1 917	S22D	0036	= 603	3 590 591
STRTGYR2	07,3213	1396	4 1397 1401	SWTOVBIT	4674	= 60		S22D=9	30,2726	593	1 589
STRULBIT	4676	= 54		SWTOVER	0207	= 60		S22EORM	E7,1673	= 122	8 122 598
STRULLSW	0134	= 54	1 54	SWWORD	0130	= 66	2 1164 1165	S22EXEX	30,3230	597	1 595
STSHOSUM	43,3517	1364	2 256	SXA	01,2411	1159	1 1084	S22FLGS	30,3326	599	2 588 593
ST52ST	13,2256	728	1 727	SXTALARM	23,2142	281	2 281	S22F2410	30,3240	597	2 590 596
SUBETA	26,3116	802	1 802	SXTANG	23,2053	280	1 443	S22F244	30,3127	596	
SUBETA2	26,3124	802	1 802	SXTANG1	23,2076	280	1 279	S22F244X	30,3126	596	1 593
SUBEXIT	E4,1770	= 89	24 89 636	SXTLOGIC	23,2027	278	1 278	S22GTP	30,3233	597	1 597
SUBLIST	0337	= 1066	12 1063 1066	SXTMARK	07,2002	215	3 444 732	S22I=N	30,2655	593	1 593
SUBTR	00,3701	1157	1 1158	SXTMARKE	07,2000	= 26	1 215	S22LOC	E5,1750	= 94	7 94 598
SUFFCHEK	12,3452	1266	3 1265 1266	SXTMARK1	10,2000	= 26	1 227	S22LSITE	30,2173	556	1 555
SUHALFA	22,2700	401	1 401	SXTNB	23,2000	278	4 445 722	S22NXTIN	30,2361	589	3 593
SUHALFAP	22,2720	401	1 401	SXTOPTN	E5,1413	= 95		S22NXTU	30,2470	590	1 590
SUPDACAL	4610	1071	2 350 1365	SXTSM	14,3273	722	2 709 720	S22NXTWI	30,2501	590	1 590
SUPDXCHZ	5122	1187	5 362 1187	SXTVAR	34,3221	573	1 569	S22NXXA	30,2525	591	1 591
SUPERBNK	0007	= 38	26 181 1457	SYNCT4	06,2156	132	1 133	S22NXXB	30,2552	591	1 591
SUPERSW	4666	1073	2 1439 1445	SYSTEST	43,2364	240	1 230	S22OFF=I	30,2720	593	1 589
SUPER011	4730	1168	3 524 1386	S1	0050	= 37	56 396 1332	S22RHO	0040	= 603	6 591 598
SUPER100	4704	= 1168		S10BITS	4747	= 1360	2 1362	S22RL	E5,1634	= 603	2 590
SUPER101	4732	1168	1 1171	S11.1	34,2436	534	2 529 644	S22RTNEX	E7,1703	= 122	3 122 597
SUPER110	4733	1168	1 1171	S13BITS	43,3235	1360	1 1366	S22SAVET	30,2652	592	2 594 595
SUPRCON	43,3234	1360	1 1366	S17.1	36,2026	540	1 547	S22SCLW	30,2641	592	1 592
SURELY.9	24,3070	653	1 653	S17.2	36,2104	541	1 548	S22SHIFT	30,2316	588	1 588
SURFFBIT	4703	= 59		S2	0051	= 37	46 421 1325	S22TOFF	E7,1667	= 122	12 122 597
SURFFLAG	0177	= 59	4 203 1282	S28VTRS	30,3005	594		S22TPRIM	E7,1671	= 122	3 122 593
SVCT3	5175	1192	1 1192	S2GETLN	30,2373	589		S22UMRL	E7,1501	= 603	7 590 598
SVDWN1	10,2237	282	3 258 1281	S2INCP1	30,3011	594		S22UOFF	1214	= 603	3 593 603
SVDWN2	10,2263	282	3 258 1282	S2INTS1	30,2702	593		S22UUT	1256	= 603	9 591 592
SVMRKDAT	E7,1537	= 118	6 118 588	S2RPTR	30,2743	594		S22WSUBL	E4,1406	85	1 595
SW/	01,2543	= 1166	1 1084	S2RTRP	30,2735	593		S22WUNL	E7,1666	= 122	1 122
SW/NDX	0305	= 69	7 1036 1058	S22.1	30,2255	587	1 555	S22W72X	30,2601	592	1 592
SWBIT	0131	= 67	5 1164 1166	S22.111	30,2271	588	1 588	S22W76X	30,2607	592	3 591 592
SWBRANCH	6664	1096	1 1166	S22.9BIX	30,3224	597	1 597	S22W78X	30,2627	592	3 592
SWCALL	4561	1070	5 184 1162	S2280X12	30,2760	594	1 595	S221X3	0030	= 603	2 598
SWCHCLR	35,2053	454	1 454	S2280X22	30,3070	595	1 589	S223X1	0022	= 603	3 590 598
SWCHSET	35,2031	453	1 453	S2280X32	30,2744	594	1 596	S2231NXT	30,3312	598	1 598
SWINIT	05,3163	188	6 179	S2280X42	30,3047	595	1 594	S2231X13	30,3303	598	2 590 591
SWITCHES	01,2543	1164	1 1166	S2280X44	30,3160	596	1 596	S30.1	31,3102	628	1 625

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SYMBOL	DEF	H	REFERENCES	SYMBOL	DEF	H	REFERENCES	SYMBOL	DEF	H	REFERENCES
S31.1	31,3154	630	1 626	T-OTHER	E3,1642	= 83	1 167	TCGETCAD	00,3753	1452	1 1453
S33/34.1	35,2212	459	1 454	TABLNTH	06,2037	130	1 130	TCLEM	E3,1674	83	
S34/35.1	35,2522	464	4 458 520	TABPCCM	17,2713	1009	4 1008	TCNOVAC	4365	371	1 358
S34/35.2	35,2534	465	2 455 458	TABRCCM	17,3026	1011	2 1011	TCPIN	43,3074	258	1 258
S34/35.3	35,2617	467	1 470	TABRZCMD	17,3110	1013	2 1013	TCPINAD	43,3077	258	1 258
S34/35.4	35,2662	468	1 470	TABYCCM	17,2764	1010	4 1009	TCQ	6711	= 1368	3 160 254
S34/35.5	35,2742	470	2 455 458	TACHEXIT	43,3055	258	1 259	TCQBNK00	00,3454	1152	1 1152
S3435.25	35,2547	465	1 517	TACTOFF	E6,1633	= 101	1 101	TCSLEEP	00,3764	1453	1 1452
S40.1	16,2000	663	1 637	TAD	7040	1102	1 1083	TCSUBTR	00,3727	1158	1 1156
S40.18	16,2073	664	1 663	TAGSUB	01,2466	1161	4 1159 1160	TCTSKOVR	4367	371	1 943
S40.13	16,2404	679	3 206 662	TAR/EREF	33,3472	440	2 441 443	TCWAIT	4366	371	1 358
S40.130	16,2430	679	2 679 680	TARGDRVE	33,3626	443	2 441 442	TDEC	1100	75	9 75 1314
S40.131	16,2461	680	1 679	TARGETNG	25,2125	799	1 798	TDECAYFX	4725	1168	
S40.132	16,2466	680	1 680	TARGETV	12,3544	1267	1 1267	TDEC1	0040	= 1318	55 203 1314
S40.133	16,2475	680	1 680	TARGTIME	E5,1614	= 90	2 517 520	TDEC2	E5,1634	= 90	2 488
S40.134	16,2477	680	1 680	TARG1/2	E5,1431	= 95	2 443	TDELTAV	E3,1520	= 82	12 82 1313
S40.135	17,2026	681	1 679	TARG1BIT	4701	= 45		TDESIRED	E5,1672	= 93	5 93 1266
S40.14	20,2276	687	2 247 982	TARG1FLG	0024	= 45	7 382 727	TDPOS	E5,1706	= 94	1 94
S40.15	16,3145	907	3 897 904	TARG2BIT	4702	= 45		TDVEL	E5,1714	= 94	1 94
S40.2,3	24,3514	667	1 637	TARG2FLG	0025	= 45	5 554 727	TEMK	1075	= 74	10 1174
S40.2,38	24,3635	669	1 668	TAR1	33,3501	441	1 441	TEMP	E5,1451	= 95	
S40.6	20,2050	683	1 638	TASKOVER	5213	1199	73 138 1453	TEMPADD	E5,1450	= 95	
S40.8	16,2130	672	1 653	TAT	0014	= 1318	11 449 1295	TEMPALFA	E6,1771	= 113	2 113 838
S40.81	20,2000	674	1 674	TAU	E6,1561	= 106	12 106 1021	TEMPBB	0064	= 1375	1 1374
S40.9	16,2257	676	1 653	TAU.	E4,1711	= 87	10 87 1304	TEMPBBCN	0073	= 1375	6 1374 1376
S41.1	22,3426	670	2 642 644	TAUCHCK	17,3144	1013	1 1013	TEMPBETA	E6,1772	= 113	3 113 838
S41.2	20,2145	684	2 246 982	TAUCHECK	17,3062	1012	1 1012	TEMPDAP	E6,1445	99	8 99 905
S50	14,2216	701	1 701	TAUNORM	21,3731	1003	2 1003	TEMPFLSH	0374	71	4 194 1439
S52.2	11,2256	725	2 693 713	TAU1	E6,1562	= 106	9 106 1019	TEMPG	0061	= 1375	11 214 1377
S52.2.1	11,2277	725		TAU2	E6,1563	= 106	9 106 1020	TEMPG2	0071	= 1375	3 1373 1376
S52.2A	11,2270	725	1 725	TAZEL1	E5,1432	95	4 440 441	TEMPNM	0063	= 1375	3 1374 1377
S52.3	16,2636	731	1 693	TBASE1	1053	73	6 214 1379	TEMPOK	06,2520	144	2 144
S52/2	11,2000	= 26	1 725	TBASE2	1055	73	2 1290	TEMPOR1	1300	77	9 564 593
S52/3	15,2000	= 27		TBASE3	1057	73		TEMPOR2	0160	= 1447	10 1431 1441
S61.1	26,2543	754	2 740 743	TBASE4	1061	73	1 198	TEMPP	0062	= 1375	6 1374 1377
S61.1A	26,2603	755	3 209 755	TBASE5	1063	73	1 527	TEMPPHS	0154	= 1383	9 1378 1383
S61.1B	26,2621	756	1 755	TBASE6	1065	73	2 656 775	TEMPPR	0070	= 1375	2 1374 1377
S61.1C	26,2564	755	2 208 755	TBITS	E6,1606	= 109	2 109 1055	TEMPP2	0072	= 1375	5 1373 1376
S61.2	26,2650	759	1 741	TBUILDFX	4724	1168		TEMPROLL	E6,1770	= 113	3 113 838
S61DT	E6,1774	= 113	3 208 755	TC	E3,1550	= 82	12 82 1311	TEMPR60	1146	75	5 381 684
S62.3	10,2302	769	1 745	TCALARM2	43,3261	1360		TEMPSET	16,3050	904	2 903 917
S8BITS	4373	= 1360	1 1367	TCCSM	E3,1622	83		TEMPSW	0065	= 1375	7 1373 1376
==========	==========	==========	==========	TCDANZIG	27,3314	= 1351	11 287 1346	TEMPSWCH	0157	= 1383	3 1378 1383
T	0036	= 1272	18 455 1266	TCDU	37,3675	839	1 837	TEMPSW2	0066	= 1375	4 1373 1376
T(X)	27,3276	1351	2 1348 1349	TCFINDVC	4370	371	1 358	TEMPTIME	E5,1440	95	2 421

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SYMBOL	DEF	H	REFERENCES	SYMBOL	DEF	H	REFERENCES	SYMBOL	DEF	H	REFERENCES
TEMPVAR	1261	= 77	3 1220 1221	TETOTHER	E3,1642	= 83		THETAN1	E5,1466	= 97	13 97 436
TEMP2G	0155	= 1383	9 1378 1383	TETTHIS	E3,1570	= 83	1 501	THETAX	E5,1460	= 96	1 96
TEMP333	E6,1510	= 100	3 100 911	TET1	0036	= 82		THETAX1	E5,1460	= 97	5 97 436
TEMREG	E6,1613	= 101	25 101 954	TEVENT	1336	78	5 78 651	THETA165	34,3747	882	1 847
TEMX	1224	= 76	5 76 785	TF	E7,1751	= 123	10 123 547	THETA210	34,3751	882	1 847
TEMY	1225	= 76	3 76 785	TFF	E4,1743	= 88	13 88 512	THETDONE	25,2226	800	1 803
TEMZ	1226	= 76	5 76 785	TFF/RTMU	0036	= 1337	7 505 1348	THETL	E7,1747	= 123	3 123 542
TEM1	0141	67	6 67 1440	TFF/TRIG	27,2573	766	4 632 761	THETZERO	E5,1616	= 91	4 91 541
TEM1B	E7,1646	= 115	8 115 821	TFFALFA	0032	= 1337	6 1341 1348	THIRD	35,3137	475	1 461
TEM2	0142	67	9 67 1475	TFFBANK	23,2410	505	1 504	THIRTEEN	4720	= 1145	5 782 1479
TEM3	0143	67	9 67 1330	TFFCALLS	23,2703	511	1 511	THISAXIS	26,3327	= 32	1 495
TEM4	0144	67	9 67 330	TFFCONIC	27,2721	1340	1 759	THISPREC	13,3022	= 32	6 448 665
TEM5	0145	67	2 67 68	TFFCONMU	27,2722	1340	1 511	THISSHIP	23,2446	506	1 505
TEN	4377	= 1171	9 186 1110	TFFDELQ	0012	= 1337	2 1349 1350	THISVINT	13,2034	203	1 1295
TENBNK14	22,3442	671	1 671	TFFELL	27,3214	1349	1 1347	THREE	6214	= 1171	53 32 1464
TENMDOT	E6,1647	= 102	3 102 902	TFFEL1	27,3216	1349	1 1347	THREE/8	11,3672	1317	1 1303
TENT	32,2156	634	1 634	TFFNP	0034	= 1337	7 765 1349	THRUST	0055	= 37	
TENTH	34,3554	585	1 582	TFFQ1	0016	= 1337	5 1346 1349	TICKTEST	23,2531	507	2 504 507
TENTHSEK	21,2345	974	1 974	TFFRP/RA	27,2770	1343	1 511	TICKTFF	23,2521	507	1 506
TEPHEM	E3,1706	83	19 84 1471	TFFRTALF	0030	= 1337	3 1341 1348	TICKTPER	23,2511	506	
TEPHEM1	1267	= 77	7 77 525	TFFSW	0167	= 58	3 1346	TIG	E7,1412	= 114	65 114 846
TERMATE	10,3520	1445	1 1443	TFFSWBIT	4712	= 58		TIG-0	24,2541	648	3 207 647
TERMEXTV	5423	= 231	3 233 236	TFFTEM	0044	= 1337	15 766 1350	TIG-5	24,2523	647	3 207 646
TERMIBIT	4674	= 56		TFFTICK	23,2554	507		TIGAVEG	24,2504	646	2 208 643
TERMIFLG	0151	= 56	2 696 724	TFFVSQ	0024	= 1337	2 765 1340	TIGBLNK	24,2366	643	3 208 639
TERMNVEC	12,3631	1268	1 1269	TFFX	0042	= 1337	8 766 1349	TIGNOW	24,2173	640	2 640 641
TERMPC3	07,2365	225	1 225	TFFXTEST	27,3122	1347	1 1347	TIGON	24,2427	644	2 209 644
TERMSXT	07,2356	225	1 225	TFFZEROS	26,3331	= 1352	2 1346 1347	TIME/RTO	E7,1523	= 115	3 115 800
TERM1TMP	0133	= 68	3 1334	TFF1/ALF	0026	= 1337	7 1341 1350	TIMECHEK	10,3447	1444	1 1444
TERM52	14,2176	698	2 225 698	TFF1/4	26,3321	= 1352	4 1340 1346	TIMECHK	22,3115	406	1 406
TERRLAMB	E5,1761	= 93	2 1265 1266	TFI	E5,1620	= 91	3 91 542	TIMEDELT	13,3710	1296	4 1294 1295
TEST	01,2612	1166	1 1166	TFO	E5,1626	= 91	2 91 541	TIMEDIDL	27,3523	1468	2 1467 1470
TESTBIT	40,3430	367	3 367	TGO	E7,1427	= 114	19 114 680	TIMEDIDR	27,3535	1468	1 212
TESTLEAD	33,2000	= 30	1 413	TGOCALC	16,2175	673		TIMEINC	13,3662	1295	1 1296
TESTLOOP	13,3234	1288	6 1286 1315	TGR26	32,2160	634	1 634	TIMEMO	E4,1433	85	2 85 738
TESTNN	41,2046	317	1 349	TGR26CON	32,2242	635	1 634	TIMEOVFL	12,2312	1247	1 1245
TESTOFUF	40,3077	344	4 341 351	THETA	0024	= 70	11 712 1321	TIMER	E5,1500	= 96	
TESTTIME	33,2443	422	1 414	THETA(1)	E4,1747	= 88	3 88 633	TIMERAD	12,3552	1268	2 851 860
TESTV8	41,2041	317		THETACON	16,2126	665	1 663	TIMESTEP	11,3155	1308	4 1289
TESTXACT	43,2076	230	18 233 1463	THETAD	1155	75	23 75 1475	TIMETEST	01,3566	1379	1 1383
TESTY	35,2260	459	1 459	THETADX	E6,1572	= 106	7 106 996	TIMETHET	12,2737	1256	6 454 890
TEST3979	04,3252	517	1 517	THETADY	E6,1573	= 106	3 106 995	TIMETST	15,3537	1054	
TET	E3,1516	= 82	30 82 1310	THETADZ	E6,1574	= 106	4 106 996	TIMETST1	15,3562	1054	1 1054
TETCSM	E3,1570	83	3 83 1470	THETAH	E7,1701	= 116	7 116 822	TIMETST2	15,3576	1054	1 1054
TETLEM	E3,1642	83	3 83 1470	THETAN	E5,1466	= 96	2 96 526	TIMETST3	15,3615	1055	1 1054

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TIMETST4	15,3617		1055 1 1054	TOBALLC	27,2034		381 1 381	TRIPA	1256	=	77 4 1220 1221
TIMETST5	15,3620		1055 2 1054 1055	TOCON2	5344		1374 1 1375	TRKMKCNT	1126		75 8 75 1293
TIMEX	35,2517		462 2 460 462	TOF-FF	27,2000	=	29 1 1340	TRMATTCK	43,2450		242 1 242
TIME1	0025	=	36 23 127 1444	TOF-FF1	27,2000	=	29 1 1352	TRM03BIT	4707	=	46 1 444
TIME2	0024	=	36 37 166 1472	TOFF	E6,1605	=	109 7 109 1055	TRM03FLG	0032	=	46 2 225 442
TIME2SAV	1150		75 5 76 1412	TOFFOVFL	15,3513		1052 1 1052	TRNSPSPD	22,2343		395 2 390 395
TIME3	0026	=	36 4 185 1198	TOFFTEST	15,3564		1054 1 1054	TRTAGXPI	15,3307		1049
TIME4	0027	=	36 4 130 185	TOGETHER	20,2163		685 1 685	TRUE360X	12,3175		1262 1 1260
TIME5	0030	=	36 25 126 1040	TOLDA2MT	E5,1641	=	97	TRUNA	1160	=	95
TIME6	0031	=	36 6 954 1030	TOLDA2T1	E5,1641	=	97	TRUNBIAS	1342		79 2 559 614
TIMRBIT	4700	=	57	TON1	E6,1621	=	110 12 110 1055	TRUNBIT	4707	=	44
TIMRFLAG	0155	=	57 4 624 641	TON2	E6,1607	=	109 10 109 1055	TRUNCMD	10,2132		163 1 162
TIMSCAL	15,3522		1053 1 1052	TON2TEST	15,3600		1054 1 1054	TRUNFLAG	0013	=	44 3 696 697
TIMSUBM	0016	=	1218 3 1215	TORQINCH	33,3064		432	TRUNION	E5,1754	=	94 2 611 614
TIMSUBO	E3,1706	=	84 1 1215	TORQNDX	E5,1450	=	96 7 414 432	TRUNVAR	31,3044		620 1 615
TINT	E7,1655	=	120 5 516 517	TORQUE	33,2122		416 1 433	TRUNX	E7,1603	=	118 2 118
TINTSGI	E5,1610	=	90 2 516 517	TPAGREE	7226		1108 15 239 1472	TRUN19	31,3035		619 1 615
TINYTHET	26,3135		803 1 800	TPASS4	E7,1655	=	120 12 120 847	TRUN19A	31,3036		619
TITER	E7,1664	=	122 6 122 461	TPDVL	6557		1093 1 1093	TRUN38	13,2274		728 1 728
TIX	01,2442		1160 1 1084	TPERTICK	23,2561		507 1 507	TSIGHT	E5,1606	=	90 13 90 734
TK	E4,1731	=	87 1 87	TPLEFTN	40,3056		343 3 329 343	TSIGHT1	15,2175		702 1 693
TKTLX/I	E6,1702	=	102 3 102 904	TPMODE	22,3562		1473 11 615 1261	TSK	21,2056		967 4 967 968
TLESS26	32,2240		635 1 634	TPREV	E5,1763	=	93 2 1265 1266	TSKOVCDR	01,3517		1202 1 1201
TLIFTOFF	1336	=	78 5 524 528	TPSL1	4420		372 6 333 343	TSLC	7565		1116 1 1083
TLIM	06,2507		144 1 135	TPUSH	00,3272		1149 1 1149	TSLCLOOP	00,2201		1124 1 1124
TLOAD	6437		1091 3 396 1171	TR*GL**P	23,3453		1330 1 1330	TSLCTEST	00,2207		1124 1 1124
TM	E6,1716	=	111 4 403 407	TRACE1	40,3141		351	TSLC2	00,2172		1124 1 1116
TMANUCHK	22,3105		406	TRACE1S	40,3152		351	TSSL	00,2101		1121 3 1119 1128
TMARK	E5,1442		95 5 421 436	TRACKBIT	4706	=	46	TSSR	00,2025		1119
TMAXFIRE	16,3732		957 2 953	TRACKFLG	0031	=	46 7 252 692	TST,TRIM	24,2364		643 1 638
TMEXITL	05,3527		1066	TRACKTRM	43,2642		252 2 229 620	TSTAB	40,3534		379 1 380
TMFAIL2	07,3704		1414 2 1415	TRANSANG	07,2440		546 1 545	TSTART82	E4,1724	=	88 5 505 507
TMFI	E6,1666	=	111 9 390 392	TRANSM1	E4,1400	=	89 2 89 431	TSTCON1	41,3644		377 1 377
TMINDEX	0336		70 6 70 1066	TRANSPCS	22,2334		395 1 390	TSTCON2	41,3645		377 1 377
TMINFIRE	16,3731		957 1 953	TRANSP1	22,3657		1477 2 280	TSTCON3	41,3646		378 1 378
TMIS	E6,1666	=	111 15 111 390	TRANSP2	22,3673		1477 1 280	TSTFORDP	41,2465		325 1 324
TMODE	6446		1091	TRFAILCF	5520		1456 2 257 575	TSTINIT	20,3450		942 1 942
TMODULO	1345		79 5 1243 1248	TRFAILCM	5532		1456 1 575	TSTINITJ	16,3265		916 2 916
TMRAD100	32,2266		851 2 843 853	TRG*NBSM	23,3572		1333 2 445 1332	TSTLTS1	41,3621		377 1 377
TMRESUME	05,3531		1066	TRG*SMNB	23,3557		1332	TSTLTS2	41,3650		378 1 377
TNIT	E7,1473	=	119 4 119 677	TRIG1	23,3224		1321 1 1321	TSTLTS3	41,3655		378 1 378
TNITPREV	E7,1475	=	119 3 119 677	TRIG2	23,3235		1321 1 1321	TSTLTS4	40,3372		360 1 378
TNONTEST	06,2231		136 1 134	TRIM/CMC	16,3261		916 1 915	TSTORE	6423		1089 1 1089
TNUV	E3,1526	=	82 12 82 1313	TRIMONLY	24,2065		638 1 643	TSTPOINT	23,3663		1335
TOBALL	27,2013		381 3 381 382	TRIMSCAL	24,3673		670 2 668	TSTRLSRM	13,2550		1209 1 1209

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TSTRT	E7,1664	=	122 3 122 458	T3RUPT	01,3416		1198 2 126 127	ULAGEOFF	24,2653		649 1 649
TSTRXLT	24,3654		669 2 669	T3RUPT2	01,3423		1198 1 1199	ULOS	E5,1624	=	90 7 90 467
TST21=0	30,3505		601 1 602	T3TOT4	E5,1640	=	91 2 265 852	UM	1234	=	77 13 77 598
TTE	E7,1726	=	116 6 116 759	T4JUMP	06,2116		132 2 131	UMPAC+	00,3170		1146 2 1146
TTEMP	E6,1672	=	111 4 406	T4RPTBB	4063		127 1 126	UMPAC-	00,3162		1146 2 1146
TTE1	E7,1732	=	116 4 117 767	T4RUP	06,2000	=	26 2 128 129	UN	E5,1675	=	93 7 93 1269
TTG/O	24,2260		641 2 207 642	T4RUPT	06,2000		128 2 126 127	UNAJUMP	00,2000		1085 1 1082
TTGPHS	24,2515		646 2 642 644	T5IDLCAP	42,3563		687 1 687	UNI	E7,1501	=	115 6 115 800
TTOGO	E7,1660	=	120 8 120 656	T5IDLER	05,3134		187 2 179 182	UNIT	00,3023		1142 2 1085 1479
TTPI	E7,1662	=	120 13 121 543	T5IDLER1	20,3674		1037 2 1034	UNITOV	00,3151		1146 3 1144
TUSED	E6,1712	=	108 7 108 1055	T5IDLER2	15,3750		1058 1 1058	UNITNORM	04,3614		1258 1 1258
TVCADDR	16,3274	=	917 3 915	T5IDLOC	05,3132		187 7 187 1058	UNITR	E3,1757		84 12 786 835
TVCCADR	16,3274		917 2 916 917	T5IDL24	24,2357		643 1 648	UNITV	E7,1507	=	115 2 115 799
TVCDAPHS	16,3177		915 1 915	T5LOC	1312		78 26 127 1058	UNITW	E3,1713		83 10 83 833
TVCDAPON	17,2032		896 1 652	T5PHASE	E6,1465	=	99 10 689 1027	UNITX	26,3327		1172 7 31 1172
TVCDICHK	20,3432		942	T5PHASE2	21,2645		984 1 971	UNITY	26,3325		1172 1 31
TVCEXADR	16,3300		917 1 916	T5RPTBB	4064		127	UNITZ	26,3323		1172 2 31 729
TVCEXEC	16,2660		901 2 899 901	T5RUPT	4065		127 2 126 127	UNN	0022	=	891 1 889
TVCEXFIN	16,3142		906 3 901 905	T5TEMP	E6,1502		99 34 973 1013	UNPACKAE	30,2234		556 2 554 555
TVCEXPHS	E6,1661	=	102 20 102 916	T5TIME	E6,1634	=	106 6 106 1007	UNP36	E4,1734	=	88 3 492
TVCINIT1	17,2054		897 1 899	T5TVCDT	E6,1635	=	101 10 101 942	UNRM	E5,1616	=	90 9 90 629
TVCINIT2	17,2102		897	T5WAIT60	21,2613		983 1 983	UNSETR1	10,3506		1444 1 1443
TVCINIT3	17,2145		898	T6ADDR	21,2614		983 1 984	UNSUSPEN	40,3400		360 1 360
TVCINIT4	17,2162		898 1 916	T6ADR	1311		78	UNZ2	06,2315		138 1 139
TVCDN2C	24,3002		652 1 649	T6ENABL	16,3706		955 5 954 955	UPACTOFF	27,3721		1471 4 194 1471
TVCPHASE	E6,1654	=	102 11 102 932	T6LOC	1310		78 4 126 1034	UPBUFF	0304	=	69 32 69 1471
TVCPITCH	0054	=	37 5 684 943	T6L1	17,3676		1029 1 1029	UPCNTRL3	25,3144		817 1 816
TVCRCS	E6,1525		100 3 100 105	T6L2	17,3703		1029 1 1030	UPCONTRL	25,3027		815 1 749
TVCTMP1	E6,1523	=	100	T6PROG	21,3743		1004 2 988 1003	UPCOUNT	0303	=	69 5 69 1465
TVCYAW	0053	=	37 3 684 928	T6PROGM	21,3053		988 2 988 994	UPDATBIT	4704	=	45
TVCZAP	24,3005		652 4 193 659	T6RUPTOR	17,3671		1029 1 1029	UPDATERT	25,2173		800 2 802
TVEC	0032	=	1318 6 1306 1307	T6SCALE	7665	=	957 1 952	UPDATEVG	24,3020		652 2 642 654
TWEEKIT	0050	=	1273 4 1252 1266	T6SETUP	17,3571		1027 1 1026	UPDATE1	27,2000	=	29
TWELVE	5660	=	1008 5 821 1013	T6START	17,3646		1029 1 983	UPDATE2	27,2000	=	29 2 1296 1464
TWIDDLE	5130		1190 5 416 660	==========	==========		==========	UPDATFLG	0027	=	45 17 252 691
TWO	4711	=	1171 82 216 1467	U=SCAXIS	27,2222		386 1 386	UPDATIME	43,2345		239 1 239
TWODT	17,2000		674 1 664	UBARO	E7,1604	=	118 6 118 618	UPDATNN	41,2317		321 3 349 364
TWOPI	35,3133		475 1 461	UBAR1	E7,1612	=	118 2 118 616	UPDATRET	0117	=	66 3 321 322
TX789	E7,1447	=	118 3 118 1227	UBAR2	E7,1620	=	118 4 118 616	UPDATVB	41,2337		321 10 314 364
T1	E7,1715	=	124 6 124 865	UBX/2	E7,1563	=	115 12 115 835	UPDATI	41,2344		322 2 321 353
T1BITS	E6,1622	=	110 2 110 1054	UBY/2	E7,1571	=	115 14 115 835	UPDNLIST	05,2214	=	165
T12	E7,1723	=	124 4 124 853	UBZ/2	E7,1577	=	115 3 115 835	UPDTCALL	22,3225		408 1 407
T2	E7,1735	=	124 7 124 866	UCL	1272	=	77 2 569	UPDTMEND	43,2361		239
T2BITS	E6,1610	=	109 2 109 1055	UCLSTAR	E7,1642	=	118 4 118 614	UPDTPHAS	4715	=	1466 1 1468
T3RPTBB	4055		127 1 126	UH/	E7,1745	=	125 5 847 879	UPEND70	27,3657		1470 1 1467

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UPEND71	27,3566		1468 1 1467	URP	0016	=	885 1 885	VACFOUND	01,2643		1178 5 1178
UPEND72	27,3620		1469 1 1467	URPV	0016	=	1318 6 1305 1318	VACSTOR	07,2243		222
UPEND73	27,3472		1467	URR	0006	=	891 2 889	VACT3	E7,1545	=	119 8 119 543
UPENT2	7717		1449 4 1438 1443	URRECT	E5,1646	=	93 4 93 1248	VACX	E4,1624	=	86 1 86
UPERCMC	43,3755		1464	UR1	E5,1723	=	93 11 93 1269	VACY	E4,1626	=	86 1 86
UPERLEM	43,3751		1464	UR1/	E7,1737	=	124 8 124 879	VACZ	E4,1630	=	86
UPERROR	43,3757		1464 2 1464	US	E5,1616	=	91 3 614 616	VAC1	0401		71
UPERROUT	27,3714		1471 4 1464 1470	USEADC	41,2105		317 1 317	VAC1ADRC	05,3147		188 1 186
UPFLAG	5435		1450 55 198 1467	USEKAY	36,2470		546 2 546	VAC1USE	0400		71 4 186 1178
UPFNOVAC	27,3500		1467 1 1467	USEMAXDT	13,3311		1288 1 1289	VAC2	0455		71
UPJOB	27,3505		1467 1 1467	USEPICS	13,2756		1282 1 1282	VAC2USE	0454		71 3 186 1178
UPLIM	12,3301		1264 1 1263	USERPRIC	0163	=	1447 3 1434 1444	VAC3	0531		71
UPLOADNV	27,3452		1466 2 1465	USPRCADR	4652		1072 3 1330	VAC3USE	0530		71 3 186 1178
UPLOCBIT	4707	=	58	USSTAR	E7,1650	=	118 3 118 614	VAC4	0605		71
UPLOCKFL	0164	=	58	USTAR	1244	=	77 5 77 594	VAC4USE	0604		71 3 186 1178
UPMNSVCD	27,2710		1297 1 1296	UT	E7,1712	=	121 13 121 670	VAC5	0661		71 1 1383
UPNEG	7530		1115 1 1115	UV1/	E7,1745	=	124 4 124 856	VAC5USE	0660		71 3 186 1178
UPOK	07,3667		1414	UW	0014	=	891 1 889	VAD	6720		1098 1 1083
UPCLOMOD	0301	=	69 3 69 1470	UXA/2	E7,1541	=	115 9 115 835	VALMIS	33,2262		418 1 432
UPOUT	27,3645	=	1470 7 1464 1471	UYA/2	E7,1547	=	115 4 115 835	VAPREC	E7,1567	=	120 2 459 462
UPOUT4	27,3646	=	1466 3 1465 1466	UZ	0024	=	1318 4 1305 1307	VARALARM	5653		1460 3 153 1407
UPPART2	27,3335	=	1464 1 1464	UZA/2	E7,1555	=	115 5 115 836	VARDELAY	5161		1190 5 137 1387
UPPART3	27,3516	=	1467	UZZ	0000	=	891 2 889	VARGAINS	16,2710		902 1 902
UPPOS	7520		1115 1 1115	U1POS	22,2242		393 1 393	VARIANCE	E7,1525	=	118 13 118 1220
UPRPTBB	4056	=	127 1 126	U2	E5,1713	=	93 5 93 1268	VARK	E6,1651	=	102 5 102 933
UPRPT1	07,3650		1414	U2POS	22,2216		393 1 393	VARSTO	E6,1511	=	100 7 100 911
UPRUPT	07,3636		1414 1 126	U3POS	22,2266		394 1 394	VARST5	E6,1516	=	100 1 911
UPSTORE	27,3454	=	1466 1 1466	==========				VARSUBL	31,3041		620 2 614 615
UPSVFLAG	E3,1501	=	82 6 82 1297	V	E7,1673	=	116 18 116 821	VARSUBL3	31,3042		620
UPTEMP	0330		69 10 69 1469	V(T1)/	E7,1671	=	124 6 124 879	VATT	0006	=	1318 24 465 1295
UPTEST	07,3710		1414 2 1414	V(T2)/	E7,1707	=	124 10 124 866	VATT1	0024	=	1318 5 480 886
UPTMFAST	06,2660		151 1 154	V(21K)	32,2236		635 1 633	VBARS	E7,1665	=	116 8 116 813
UPVERB	0302	=	69 5 69 1467	V(24K)	32,2226		635	VBCOARK	43,2154		233 1 229
UPVERBSV	0331		69 2 1463 1464	V(26K)	32,2244		635 1 634	VBFANDIR	41,2146		318 1 318
UPVERIFY	27,3417		1466 3 1465 1466	V(28K)	32,2222		635	VBPROC	40,3343		358 5 319 366
UPVRFYNV	27,3453		1466 1 1466	V(3K)	32,2224		635 1 633	VBRELDSP	40,3362		360 1 308
UPWAKE	27,3510		1467	V(32K)	32,2232		635 1 634	VBRESEQ	40,3360		359 1 319
UP21	4376	=	1466 1 1465	V(4K)	32,2234		635 1 633	VBRQEXEC	41,3456		358 1 319
UP70	4714	=	1464 1 1463	V(400)	32,2220		635 1 633	VBRQWAIT	41,3502		358 1 319
UP71	4712	=	1464 1 1463	V-OTHER	E3,1727		83 4 167 283	VBSP1LD	41,3001		337 2 335 336
UP72	4711	=	1464 1 1463	V/SC	7573		1117 1 1083	VBSP2LD	41,3002		337 2 335 336
UP73	6214	=	1464 1 1463	V/SCDV	00,2750		1140 3 1139	VBSP3LD	41,3003		337 1 335
UR	0010	=	885 1 885	V/SC1	7601		1117 1 1117	VBTERM	40,3351		359 2 319 365
URH	E7,1541	=	115 2 763 767	V/SC2	00,2654		1138 1 1117	VBTSTLTS	41,3603		377 1 319
URONE	E4,1742	=	88 4 741 763	VACDSP	10,3005		1436 1 1436	VBUF	0122		66 58 66 1334

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SYMBOL	DEF	H	REFERENCES	SYMBOL	DEF	H	REFERENCES	SYMBOL	DEF	H	REFERENCES
VBZERO	43,2130		232 1 229	VERB	40,2255		312 1 308	VLOADCOD	4674	=	1171 1 1090
VB04N06	34,3652		607 1 606	VERBFAN	41,2133		318 7 317 320	VLTEST	25,3051		815
VB06N18	34,3653		607 1 606	VERBMASK	4160	=	1447 1 1432	VMAGI	E7,1722	=	116 6 116 838
VB06N22	15,2156		694 1 693	VERBNOUN	E4,1765	=	88 7 88 548	VMAX	E4,1403		85 1 570
VB06N98	33,2442		422 1 422	VERBREG	1001		72 20 187 368	VMIN	26,3321	=	831 1 802
VB51	07,2426		226 1 225	VERBSAVE	1041		73 3 317 356	VMODE	6470		1091 3 1113 1472
VB53	15,2360		734 1 732	VERBTAB	41,2151		318 1 318	VMOON	E5,1751	=	92 7 92 702
VB56CADR	4553		620 1 620	VERB37	04,2000	=	25 3 189 201	VMT/180	15,3755		1059 1 1051
VB6N5	14,2762		713 1 712	VERB69	43,2037		229 1 229	VN	1176		76 18 166 1293
VB64	43,2476		243 1 229	VERB94	43,3124		259 1 230	VNCOMP17	35,3517		548 4 548 549
VCNTR	E6,1653	=	102 6 102 902	VERB96	43,3146		259 1 230	VNCON	43,2777		256 1 256
VCNTRTMP	E6,1663	=	102 5 102 902	VERIFBIT	4710	=	58	VNDSPCON	40,3221		353 1 353
VCRCS	34,3730		882 1 846	VERIFLAG	0165	=	58	VNDSPLY	04,3424		521 4 515 518
VCSPS	34,3726		881 1 846	VERTORFT	33,2227		417	VNG0641	04,2650		443 1 443
VCV	E3,1542	=	82 21 82 1311	VESO	E4,1540	=	86 3 86 738	VNLODCDU	43,2243		235 1 235
VCVCSM	E3,1614		83 1 619	VFINAL	26,3277		832 1 805	VNLODCDU	43,2177		234 2 233 242
VCVLEM	E3,1666		83	VFINAL1	26,3301		832 1 804	VNLODDT	43,2363		239 1 239
VDEF	00,3232		1149 1 1085	VFLAG	0062	=	49 4 705 707	VNLODGYR	43,2273		236 1 236
VDISP	E6,1710	=	112 1 112	VFLAGBIT	4701	=	49	VNPLANV	15,2453		735 1 734
VDT/180	E6,1567	=	110 8 1051 1056	VG	E7,1457	=	119 6 119 674	VNPOOH	35,3114		474 5 453 547
VD1	4374		371 18 187 1171	VGAMCALC	26,3050		765 2 632 760	VNSTORE	E7,1763	=	124 3 124 845
VEARTH	E5,1735	=	92 6 92 734	VGBODY	E7,1664	=	121 6 121 642	VN0629	33,3772		445 1 445
VECAGREE	00,3010		1141 4 1138 1479	VGDISP	E7,1653	=	120 7 272 672	VN0641	33,3456		440 1 440
VECANG1	27,2321		387 1 386	VGPREV	E7,1720	=	121 5 642 678	VN1	1237	=	76 4 76 1295
VECANG2	27,2323		387 1 386	VGTEMP	E7,1645	=	120 4 653 678	VN1645	35,3005		471 5 455 848
VECLEAR	27,2131		385 1 385	VGTIG	E7,1720	=	121 12 121 679	VONE	E4,1734	=	87 11 88 1340
VECMODE	22,3540		1472 1 1475	VHFCNT	1125		75 10 170 847	VONE'	E4,1771	=	89 4 89 1346
VECOEM	E4,1436	=	85 5 85 739	VHFGOOD	27,2523		576 1 576	VPASS3	E7,1561	=	119 10 119 541
VECOFANG	22,2724		401 2 401	VHFRANGE	1256	=	77 2 571 575	VPASS4	E7,1637	=	120 7 120 546
VECPOINT	27,2126		385 4 381 585	VHFRBIT	4702	=	61	VPDVL	6542		1093
VECPT	27,2000	=	29 1 384	VHFREAD	27,2476		575 2 127	VPPREC	E7,1611	=	120 2 459 462
VECQTEMP	E6,1710	=	110 3 385 387	VHFRFLAG	0215	=	61 4 194 568	VPRED	E7,1786	=	117 8 116 852
VECSGNAG	22,3767		1479	VHFTIME	1151	=	76 5 170 575	VPROJ	7374		1113 1 1083
VECSHIFT	22,3412		489	VHHOOT	34,2303		529 1 529	VQUIT	26,3213		831 2 807 821
VECTAB	E4,1616	=	86 9 86 1316	VINIT	E7,1575	=	119 12 119 665	VRCALC	27,2626		767 2 759 767
VECTIME	E4,1722	=	87 4 87 890	VINTFBIT	4710	=	50	VRCONT	26,3257		832 1 805
VEHUPBIT	4703	=	45	VINTFLAG	0071	=	50 20 202 1313	VRECT	E3,1510	=	82 10 82 1311
VEHUPFLG	0026	=	45 14 253 1226	VIO	E7,1724	=	116 5 115 760	VRECTCSM	E3,1562		83
VEL	E7,1515	=	115 4 115 799	VIPRIME	E7,1611	=	119 16 119 677	VRECTLEM	E3,1634		83
VEL/C	E7,1473	=	114 5 114 735	VL	E7,1766	=	116 13 274 815	VRECTI	0030	=	82
VELSC	33,3677		444 1 430	VLAUN	E5,1520	=	96 5 430 431	VREF	1157	=	76 4 816 817
VELVECT	E4,1744	=	87 4 87 890	VLAUNS	E5,1472	=	96	VREFER	25,3631		827 6 821 822
VEM	26,2173		738 1 738	VLMIN	26,3203		831 1 807	VRIGHT2	00,2242		1126 1 1126
VEMA	26,2200		738 1 739	VLOAD	6454		1091 1 1083	VROTATEX	7367		1112 3 1122 1144
VEMSCON	26,3025		762 1 760	VLOAD*	6056	=	1171 1 1090	VROUND	7107		1104 6 1112 1113

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VRPREV	E7,1465	=	119 3 119 677	V06N22	4745	1168	3 389 750	V06N94B	15,2362	734	1 732
VSHRRND	00,2073		1120 4 1122 1158	V06N30S	06,3540	296		V06N99A	40,3727	623	1 621
VSHR2	00,2060		1120 1 1120	V06N31**	31,3536	891	1 887	V06N99DS	40,3575	621	1 621
VSQ	00,3245		1149 1 1085	V06N33	35,3722	627	1 626	V06N9933	40,3605	621	1 621
VSQ/4API	E6,1616	=	109 5 109 1051	V06N33SR	04,3435	521	1 515	V0648	42,2057	247	1 247
VSQMIN	15,3753		1059 2 1050 1051	V06N34	15,2155	694	1 692	V0694	37,2535	561	1 560
VSQSUB	00,3317		1150 3 1142 1149	V06N34**	31,3535	891	2 886 888	V1	0325	= 69	18 69 819
VSQUARE	E7,1621	=	115 6 115 824	V06N34SR	04,3441	521	1 516	V1LEAD	25,2425	806	1 806
VSSL	00,2145		1123 3 1122 1128	V06N37	35,3125	475	3 453 547	V1STO2S	22,3547	1473	5 386 1324
VSSR	00,2127		1122 1 1126	V06N40	24,2351	642	8 637 661	V16N35	35,3724	627	
VSTORE	6412		1089	V06N42	35,3723	627	1 626	V16N40	24,2353	642	1 639
VSU	6716		1098 1 1083	V06N43	37,2101	449	1 449	V16N44	23,2407	505	2 505 508
VSUN	E5,1743	=	92 9 92 734	V06N45	35,3725	627		V16N45	35,3132	475	2 471 624
VS1	E7,1671	=	116 5 116 816	V06N45B	30,2162	555	1 553	V16N53	35,3311	496	1 494
VTARGET	E5,1704	=	93 4 93 1267	V06N47	42,2060	247	1 246	V16N54	35,3310	496	1 494
VTARGTAG	E5,1703	=	93 5 93 1267	V06N49	34,3225	573	1 573	V16N67	26,2542	753	1 751
VTEMP	1226	=	77 2 77 567	V06N49EE	30,3655	603	1 595	V16N69	26,2472	749	1 749
VTIG	E7,1637	=	120 7 120 670	V06N51	42,3704	885	1 885	V16N85B	24,2350	642	2 640 642
VTPRIME	E7,1617	=	119 9 119 545	V06N55	35,3126	475	2 473 548	V1683	24,2346	642	1 645
VV/SC	7576		1117	V06N55SR	04,3436	521	1 515	V2(T1)/	E7,1677	= 124	7 124 879
VVEC	E5,1745	=	93 20 93 1269	V06N57SR	04,3440	521	1 516	V2T1X	32,3472	873	2 871 875
VVXSC	7353		1112	V06N58	35,3127	475	2 455 548	V2T100	32,3132	868	2 842 862
VXM	7306		1110 1 1083	V06N58SR	04,3442	521	1 518	V2T102	32,3232	869	1 869
VXM/MXV	7311		1111 1 1110	V06N59	35,3130	475	1 470	V2T105	32,3237	869	1 869
VXSC	7350		1112 1 1083	V06N60	26,2423	746	1 741	V2T110	32,3244	869	1 869
VXV	7427		1114 1 1083	V06N61	26,2424	746	2 740 744	V2T115	32,3274	870	2 870
VZC	E7,1634	=	118 4 118 619	V06N62	34,2511	535	1 529	V2T120	32,3305	870	1 870
V01N25	10,3624		1447 2 1435 1437	V06N63	26,2425	746	1 742	V2T125	32,3316	870	2 870
V01N70	14,2705		710 1 708	V06N64	26,2426	746	1 746	V2T130	32,3324	870	1 870
V01N71	14,3411		724 1 724	V06N66	26,2510	751	1 751	V2T135	32,3335	871	2 870
V01N71B	15,2361		734 1 733	V06N68	26,2437	748	1 748	V2T140	32,3340	871	4 869 870
V04N06	10,3630		1447 1 1437	V06N72	35,3543	549	1 548	V2T145	32,3346	871	3 869 871
V04N06SR	04,3437		521 1 516	V06N81	35,3131	475	2 470 626	V2T150	32,3353	871	1 871
V04N46	42,2061		247 1 246	V06N81SR	04,3443	521	1 518	V2T155	32,3365	871	1 871
V05N06M1	10,3643		1447 1 1440	V06N84	13,2163	502	2 500	V2T160	32,3372	871	1 871
V05N09	4743		1168 5 454 1458	V06N85B	24,2347	642	2 641 656	V2T165	32,3400	871	2 871
V05N30E	33,3470		440 1 440	V06N87NB	37,2441	559	1 559	V2T175	32,3420	872	1 871
V05N70	31,3050		620 1 605	V06N89	30,2167	555		V2T185	32,3433	872	1 871
V05N70**	31,3537		891 1 888	V06N89*	16,2505	694	1 695	V2T195	32,3455	872	1 872
V05N7022	30,2163		555 1 553	V06N89A	14,2152	698		V2T200	32,3463	872	1 872
V05N71	31,3051		620 1 611	V06N89B	30,3656	603	2 556 597	V2T205	32,3466	873	2 872
V05N7122	30,2164		555 1 554	V06N9CN	04,3102	493	1 493	V2T300	32,3470	873	6 871 872
V06N07	10,3625		1447	V06N92	14,2151	698	1 696	V37	04,2010	192	2 260 357
V06N16N	04,3101		493 1 492	V06N93	15,2234	711	1 711	V37BAD	04,2072	193	1 197
V06N18	27,2125		383 2 381 382	V06N93S	33,3622	442	1 442	V37FLAG	0162	= 57	2 497 780

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V37FLBIT	4705	= 58		V72UPDAT	43,3725	1463	1 229	V99TJOB	24,3326	659	
V37KLEAN	05,2477	180	1 195	V73UPDAT	43,3727	1463	4 229 1463	==========			
V37NCNC	04,2257	196	1 194	V74	43,2710	= 253		W	E5,1400	= 90	73 90 1313
V37N99	04,2007	190	1 189	V82CALL	23,2332	504	1 248	WAITADR	0063	= 65	3 1190 1194
V37QCAD	04,2376	199	1 196	V82EMBIT	4676	= 60		WAITBANK	0062	= 65	1 1193
V37XEQ	04,2261	197	1 199	V82EMFLG	0211	= 60	7 506 511	WAITBB	5155	1190	2 1190 1199
V37XEQC	04,2310	197		V82FLAGS	E4,1742	= 88	7 88 507	WAITEXIT	0061	= 65	5 1190 1452
V4N06RTE	36,3243	848	1 846	V82GOFF	23,2337	504	1 504	WAITLIST	5140	1190	58 137 1399
V41K	14,3267	721	1 719	V82GOFF1	23,2411	505	1 505	WAITMASK	10,3106	1438	1 1438
V5N09RTE	32,2265	850	1 850	V82GOFLP	23,2357	504	1 505	WAITONE	27,2404	574	3 567 574
V5ONOC	10,3626	1447	1 1442	V82GON	23,2566	508	1 504	WAITONE1	27,2406	574	1 574
V5ON25	07,2425	226	1 226	V82GON1	23,2604	508	2 508 509	WAITTEMP	0064	= 65	3 1197
V5ON25P	31,3053	620	1 610	V82GON2	23,2637	508	1 508	WAIT1/2	16,3332	949	
V5OPASTE	10,3331	1442	1 1442	V82GON3	23,2657	509	1 509	WAIT2	01,3246	1193	2 1190
V51NB	37,2443	559	1 561	V82PERF	43,2551	248	1 230	WAKE	13,3427	1290	2 1291
V52	43,3153	260	1 229	V82REDSP	23,2576	508	1 508	WAKECAD	00,3765	1453	1 1452
V53	37,2534	561	1 561	V82STALL	23,2370	505	1 505	WAKECADR	10,3636	1447	3 1438 1439
V59FLAG	0116	= 52	2 558 559	V83	35,3177	494	1 496	WAKEPLAY	10,3152	1439	1 1444
V59FLBIT	4677	= 52		V83CALL	35,3204	494	2 32 494	WAKEP62	26,2374	745	2 208 1045
V59NB	37,2442	559	1 558	V83PERF	43,2556	248	2 230 249	WAKER	00,3757	1452	1 1453
V6N22	14,3266	721	1 719	V85PERF	43,2570	249	1 230	WAKESTAL	13,3464	1291	2 1290
V6N33RTE	36,3242	848	2 841 846	V86PERF	43,2635	251	1 230	WAKETEST	01,3065	1183	1 1183
V6N34	37,2102	449	1 448	V89CALL	34,3603	606	1 255	WAKE1	13,3430	1290	1 1290
V6N39RTE	36,3245	848	1 845	V89PERF	43,2734	255	1 230	WANGI	E5,1446	= 96	1 414
V6N49	31,3046	620	1 615	V89RECL	34,3625	606	2 606 607	WANGO	E5,1444	= 96	1 414
V6N60RTE	36,3246	848	2 841 845	V90PERF	43,3140	259	1 230	WANGT	E5,1450	= 96	1 96
V6N61RTE	36,3244	848	1 845	V94ENTER	31,2173	610	2 206 610	WBODY	E6,1525	= 105	15 105 998
V6N81RTE	36,3247	849	1 845	V94FLAG	0213	= 60	4 259 611	WBODY1	E6,1527	= 105	6 407 996
V6N89	31,3047	620	1 610	V94FLBIT	4700	= 60		WBODY2	E6,1531	= 105	7 105 996
V60	43,2307	237	1 229	V97E	24,3434	661	1 658	WCALC	22,2740	403	
V61	43,2315	237	1 229	V97ETASK	24,3443	661	2 209 661	WDAGAIN	41,3361	353	2 353 354
V62	43,2320	237	1 229	V97E40.6	24,3462	661	1 207	WDCNT	0137	= 67	5 351 354
V63	43,2325	237	1 229	V97N00	10,3667	1448	1 1442	WDRET	0115	= 66	9 351 354
V67	43,3174	260	1 229	V97P	24,3405	660	1 658	WEARTH	26,3653	1218	1 1216
V67CALL	40,3571	621	1 260	V97PTASK	24,3413	660	2 209 660	WEIGHT/G	E6,1475	99	9 99 911
V67DEC2	40,3732	623	1 621	V97T	24,3352	659	1 658	WHICHALF	15,3337	1050	
V67EXITX	40,3646	621	2 621	V97TRCS	24,3376	660	1 209	WHIMPER	5614	1459	1 1459
V67FLAG	0210	= 60	3 621 622	V97TTASK	24,3361	660	2 209 659	WHOCARES	E7,1777	= 125	7 125 1436
V67FLBIT	4675	= 60		V97VCNTR	E6,1444	99	8 209 902	WHOLECON	42,3447	345	3 344 345
V67WMID	40,3643	621	1 621	V99E	24,3314	659	1 658	WITCHONE	10,3333	1442	3 1434 1438
V67WORB	40,3636	621	1 621	V99EJCB	24,3320	659		WIXA	1252	= 77	6 77 1225
V67WW	40,3653	622	1 621	V99FLASH	24,3502	662		WIXB	1253	= 77	4 77 1225
V67XXX	40,3721	622	1 622	V99P	24,3330	659	1 658	WL	21,3422	997	2 1001
V70UPDAT	43,3721	1463	1 229	V99P/TIG	24,3347	659	2 659	WL-H/SLP	21,3415	997	2 999 1000
V71UPDAT	43,3723	1463	1 229	V99T	24,3322	659	2 658 660	WLH	21,3416	997	1 999

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SYMBOL	DEF	H	REFERENCES	SYMBOL	DEF	H	REFERENCES	SYMBOL	DEF	H	REFERENCES
WLH/SLOP	21,3414		997 1 999	XCHX	01,2417		1160 1 1084	XSTORE	01,2373		1159 3 1159
WLMH	21,3420		997 1 1000	XCOMMCN	12,3071		1260 1 1262	XSU	01,2436		1160 1 1084
WLOOP	12,3016		1259 1 1259	XD/360	E6,1615	=	109 5 109 1052	XTMP1	0006	=	603 3 602 603
WMATEND	11,3574		1314 1 1312	XDC	E5,1713	=	92 11 92 1326	XTRANS	E6,1631	=	106 4 106 1008
WMATRXNG	43,2744		255 1 230	XDELVBIT	4704	=	47	XTILIM	32,3747		880 2 869
WMIDPOS	E6,1400		98 2 612 621	XDELVFLG	0045	=	47 8 470 847	XTILIMX	32,3774		880 1 880
WMIDVEL	E6,1401		98 1 621	XDIFF	12,2146		1245 1 1245	XTILIM5	32,3772		880 1 880
WORBPOS	E4,1404		85 2 589 621	XDSPBIT	4712	=	52	XUNIT	04,3450		1173 4 31 1206
WORBVEL	E4,1405		85 2 589 621	XDSPFLAG	0112	=	52	XXXALT	E7,1455	=	119 4 119 486
WORKW	0000	=	603 2 601	XI	0030	=	1272 7 1245 1265	X1	0046	=	37 89 432 1476
WOZERO	05,3430		1064 2 1064 1069	XKEP	E3,1552	=	82 3 93 1311	X1CON	32,2246		635 1 633
WPLATI	E5,1570	=	96	XKEPCSM	E3,1624		83	X2	0047	=	37 39 448 1341
WPLATO	E5,1474	=	96	XKEPLEM	E3,1676		83	X789	E3,1700		83 9 593 1227
WRDRET	0115	=	66	XKEPNEW	E4,1705	=	86 4 87 1299	==========			
WRENDPOS	E4,1400		85 2 568 621	XLNMASK	17,2662		1008 2 1007	YACLIM	20,2727		928
WRENDVEL	E4,1401		85 1 621	XLNNDX	17,2707		1008 8 1009 1026	YACTOFF	E6,1426		98 7 273 905
WRTN17	21,3227		991 1 990	XLN1NDX	17,3020		1011 4 1012 1025	YACTTMP	E6,1705	=	102 4 102 905
WRTN22	21,3165		990	XMAX	0012	=	1271 9 1244 1247	YAWANG	0024	=	885 2 884 885
WTABORT	01,3375		1196 1 1194	XMIN	0014	=	1272 8 1244 1247	YAWDAP	20,2616		927 1 938
WTEMP	E6,1513	=	105 13 105 1000	XMIN/360	15,3757		1059 1 1051	YAWLIM	15,3212		1046 2 1043
WTGTSMPL	33,2545		427 1 427	XMCDULC	1343		79 6 1243 1249	YAWTIME	17,3257		1020 2 1023
WTLISTNT	33,2527		427 1 210	XNB	E5,1713	=	92 24 280 1477	YAWTS	20,3403		938 1 921
WTLST2	01,3403		1197 8 1195 1196	XNBADR	33,2445		422 1 414	YBIAS	24,3675		670 1 668
WTLST4	01,3272		1194 1 1197	XNBEB	22,3655		1477 1 1477	YBLASTOK	17,3315		1020 1 1020
WTLST5	01,3322		1195 1 1193	XNB1	E5,1554	=	90 15 90 1477	YBYPASS	17,3565		1026 1 1020
WTLTCADR	01,3766		1383 3 1379 1382	XNB1EB	22,3656		1477 1 1477	YCMD	E6,1632	=	101 5 101 931
WTOPTION	1316		78 7 156 178	XNDX1	E6,1513	=	105 7 105 1023	YCOPY	20,3022		931 2 917 930
WWOPT	E4,1724	=	622 3 276 622	XNDX2	E6,1514	=	105 6 105 1026	YCOPYCYC	20,3020		930
WWPOS	E4,1720	=	622 8 276 622	XOLDBLF	E6,1536	=	113 3 113 778	YDAPEND	20,3021		930
WWVEL	E4,1722	=	622 7 276 622	XPIPBLF	E6,1533	=	113 4 113 778	YDC	E5,1721	=	92 5 92 1326
==========				XPREV	E3,1552	=	93 2 1245 1249	YDELOFF	E6,1627	=	101 5 101 928
X	0024	=	1272 24 1244 1260	XPRODUCT	16,2237		674	YDLADDER	20,2761		929
X(T1)	E7,1721	=	124 23 124 879	XREG	1003		72 5 264 339	YDOTLIM	15,3210		1046 2 1043
X(T2)	E7,1725	=	125 12 842 868	XREGLP	1006		72 3 311 339	YDSUM	E6,1567	=	101 4 101 931
X(T2)PRE	E7,1723	=	125 3 858 862	XRNGERR	E7,1675	=	116 1 274	YDSUMC	20,3000		929
XACTALM	43,2120		231	XROT	27,2304		387 1 387	YERORLIM	20,2657		927
XACTO	43,2122		231	XRS	E7,1745	=	123 10 123 548	YERRB	E6,1617	=	101 3 101 931
XACTOQ	43,2474		243 2 232	XR1HOLD	E4,1720	=	87 6 87 889	YFORWARD	20,2666		928
XAD	01,2425		1160 1 1084	XS/360	15,3761		1059 2 1051 1059	YINDEX	E6,1521	=	105 3 105 1010
XAD2	01,2430		1160 2 1160	XSCD	E7,1451	=	114 1 114	YINTEGRL	20,2631		927
XANG	07,2000	=	26 1 546	XSCREF	0306	=	70 6 668 669	YJETCODE	15,3215		1046 2 1042 1045
XCHNYLOC	10,3351		1442 1 1438	XSM	E5,1671	=	92 35 92 1323	YJETS	17,2763		1010 3 1010 1030
XCHQADD	10,3143		1439 1 1436	XSMADR	33,2446		422 1 434	YK1K2	32,2216		635 1 634
XCHSLEEP	10,3112		1438 1 1439	XSMD	0306	=	70 7 70 731	YMANNDX	E6,1660	=	107 5 111 993
XCHTGEND	10,3350		1442 3 1434 1436	XSQC(XI)	0034	=	1272 5 1247 1254	YMISC	20,3053		931

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YNB	E5,1721	= 92	7 280 1323	ZBLAST2	17,3757	1030	1 1029	ZSM	E5,1705	= 92	4 92 1323
YNB1	E5,1562	= 90	4 90 280	ZOC	E5,1727	= 92	5 92 1326	ZSMD	0322	= 70	4 70 731
YNDX	E6,1515	= 105	10 105 1024	ZERINFLT	23,2265	288		ZTOCSC	06,3047	156	1 156
YNLADDER	20,2747	929		ZERO	4714	1167	295 130 1479	ZTOMAN	06,3037	156	1 156
YNSUM	E6,1565	= 101	5 101 931	ZEROADS	00,3376	1151	2 1151	ZUNIT	04,3444	1173	5 32 1307
YNSUMC	20,2760	929		ZEROCMOS	21,3737	1004		ZV	1117	= 75	8 1309 1314
YOFFSET	20,2714	928	1 964	ZERODP	04,3452	= 1173		Z123	36,3262	1219	1 1220
YOLDBUF	E6,1537	= 113	2 113 775	ZEROER	21,2764	987	1 987	==========			
YOUT	20,2730	928		ZEROEROR	22,3272	409	1 402	0.5SEC	37,2775	778	1 775
YPIPBUF	E6,1534	= 113	2 113 775	ZEROICDU	5410	1384	4 138 1386	0.6SECTS	21,2007	689	1 689
YREG	1004	72	3 336 344	ZEROING	33,2356	420	3 415 434	OEBANK	43,3336	1362	
YREGLP	1007	72	2 72 344	ZEROINGI	33,2360	420	1 420	==========			
YROUND	20,2722	928		ZEROJET	21,2616	983	5 537 984	1.0B18	31,3037	620	1 617
YSCD	E7,1457	= 114	1 114	ZERONDX	E5,1655	= 97	2 97 419	1.1RTE81	34,3712	881	1 877
YSCREF	0314	= 70	5 668 669	ZERONDX1	E5,1655	= 97	5 414 434	1.11SPOT	01,2025	205	
YSM	E5,1677	= 92	7 92 1323	ZEROO	26,3331	= 1227		1.2SPOT	01,2071	= 205	2 205
YSMD	0314	= 70	4 70 731	ZEROPCDU	06,3210	159	1 158	1.3SECDP	13,2316	728	1 727
YSTROKER	20,2625	927		ZERORTE	34,3700	881	6 853 880	1.3SPOT	01,2014	205	1 205
YTAUNEG	17,3265	1020	1 1020	ZEROTS	21,2537	982	1 982	1.5SPOT	01,2017	205	
YTAUPOS	17,3267	1020	1 1020	ZEROVEC	04,3452	1173	13 31 1317	1.7SPOT	01,2022	205	
YUNIT	04,3446	1173	1 31	ZEROVECS	26,3331	1172	22 31 1227	1.8SEC	14,2175	698	1 697
YV	1111	= 75	11 75 1314	ZI	E5,1722	= 94	16 94 1224	1-CSTH	E5,1735	= 93	4 93 1264
YWORD	17,2725	1009		ZIXA	1254	= 77	5 77 1225	1-E(-AT)	20,3404	938	2 924 929
YWORD1	E6,1455	= 99	4 99 1029	ZIXB	1255	= 77	5 77 1225	1/ACTSAT	20,3400	938	1 934
YWORD2	E6,1456	= 99	4 99 1030	ZMEASBIT	4701	= 43		1/C	15,2165	702	1 702
YZERO	E6,1744	= 103	5 928	ZMEASURE	0005	= 43	3 612 619	1/CONACC	E6,1650	= 102	6 102 952
YZSTORE	20,2705	928		ZNB	E5,1727	= 92	7 280 1323	1/ERRLIM	4710	= 938	1 933
YZTABLE	17,3200	1017	4 1012 1025	ZNB=S1	23,2145	281	1 280	1/GMAX	26,3327	= 832	1 823
Y1	E6,1577	= 101	3 101 931	ZNB1	E5,1570	= 90	5 90 281	1/GYRO	06,3474	296	3 294 298
Y1FILJMP	20,2660	927		ZNDX	E6,1516	= 105	9 105 1025	1/KA1	26,3303	832	1 804
Y1TMP	E6,1726	= 104	2 928 931	ZOLDBUF	E6,1540	= 113	1 776	1/KB1	26,3207	831	1 817
Y2	E6,1601	= 101	3 101 931	ZONE	1307	78	4 159 162	1/K44	26,3275	832	1 805
Y2FILJMP	20,2736	929		ZOPALARM	06,3041	156		1/MINLIM	16,3727	957	
Y2TMP	E6,1730	= 104	2 929 931	ZOPFIN1	06,3057	156	3 156	1/MU	0016	= 1271	4 1243 1263
Y3	E6,1603	= 101	3 101 931	ZOPFIN2	06,3064	156	1 156	1/PIPA	06,3262	290	2 429 779
Y3TMP	E6,1732	= 104	2 929 931	ZOPFIN3	06,3065	156	1 154	1/PIPADT	1074	74	10 74 721
Y4	E6,1605	= 101	4 101 931	ZOPTCNT	1317	78	4 156 158	1/PIPAGT	33,3425	438	1 434
Y4TMP	E6,1734	= 104	2 929 931	ZOPTDES	06,3027	156	1 155	1/PIPAI	06,3272	290	1 291
Y5	E6,1607	= 101	4 101 931	ZPIPBUF	E6,1535	= 113	2 113 776	1/ROOTMU	0022	= 1271	5 1243 1254
Y5TMP	E6,1736	= 104	3 103 931	ZPRIME	0026	= 70	7 1319 1320	1/RTMU	27,3315	1352	1 759
Y6TMP	E6,1740	= 104	1 929	ZREG	1005	72	3 317 345	1/RTMUE	23,2455	506	3 505 761
==========				ZREGLP	1010	72	2 72 345	1/RTMUM	23,2453	506	1 508
Z	0005	= 36	17 263 1459	ZRUPT	0015	= 36		1/SQRT3	40,3730	623	2 621
ZBLAST	17,3751	1030	1 1029	ZSCD	E7,1465	= 114	1 114	1/TMXFIR	4710	= 957	1 953
ZBLAST1	17,3754	1030	1 1029	ZSCREF	0322	= 70	8 668 669	1/WIE	23,2255	287	2 287

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1/WLOOP	12,3154		1261 1 1261	17TO2C	43,3640		1366				
1/12TH	26,3144		830 2 813 832	18SEC	24,2343		642 1 638	20DEGS-	23,2326		289 1 281
1/16A1	15,3754	=	1059 1 1049	180/8ATT	15,3754		1059 4 1050 1059	20DEGSMN	13,2320		728 1 728
1/2SECX	4731	=	438 1 434	19.77DEG	37,2444		559 1 559	20J	37,3371		787 1 786
1/3RD	26,3145		830 2 813	19DECML	4374	=	438 1 428	20KFT/S	26,3005		761 1 760
1/6TH	14,2706		710 1 708	==========				20MRUPT	7700	=	132 3 130 132
1/8TH	26,3151		831 2 808 816	2.11SPOT	01,2041		206	20MS	4711	=	943 1 943
1BITDP	27,2325		387 3 632 803	2.13SPOT	01,2044		206	20OCS	30,3760		666 2 666
1B1	04,3450	=	1218 1 1208	2.2SPOT	01,2071	=	205 1 205	20OCSHI	16,2374		678 1 677
1REV	12,2051		1244 1 1243	2.3SPOT	01,2030		206 1 205	20OMS	4112	=	160 2 158
1RTEB1	34,3654		881 6 859 868	2.5SEC	37,3143		781	21/22REG	0115	=	66 3 308 379
1RTEB10	34,3664		881 1 880	2.5SPOT	01,2033		206	22DSPBIT	4676	=	47
1RTEB12	34,3666		881	2.7SPOT	01,2036		206	22DSPFLG	0040	=	47 3 589 594
1RTEB13	34,3670		881 2 841 846	2/3	11,3716	=	1317 1 1305	22SUBSCL	E5,1744	=	94 4 94 556
1RTEB17	34,3672		881 2 868 869	2BLANK	40,2502		315 6 312 368	25DECML	33,2552		427 2 427
1RTEB2	34,3656		881 6 842 859	2C1HS	26,3271		832 3 806 819	25NN	26,3221		831 1 811
1RTEB25	34,3674		881	2D/SD2	15,3043		1043 2 1042	26P50S	26,2000	=	29 1 729
1RTEB28	34,3676		881 4 844 875	2DEGRES	33,3711		444	27TO30	43,3646		1366
1RTEB3	34,3660		881 2 859 861	2DZERO	04,3452	=	1207	270DEG	23,2324		289 1 281
1RTEB4	34,3662		881	2E8ANK	43,3352		1362 1 1363	290KFT	26,2777		761 1 759
1SEC	4734		1168 10 422 656	2HS	26,3261		832 2 818 823	==========			
1SECX	4734	=	422 1 414	2HSGMXSG	26,3263		832 1 823	3.1SEC	04,2402		199 1 193
1SECXT	E5,1644	=	97	2INTOUT	40,2636		330 1 327	3.11SPOT	01,2060		206
1SECXT1	E5,1644	=	97 3 414 434	2J	37,3373		787 1 786	3.13SPOT	01,2063		206
1SEC2D	17,2020		681 1 680	2JETT	4740	=	1059 2 1052 1053	3.15SPOT	01,2066		206
1STOR2ND	10,3311		1441 1 1441	2J3RE/J2	13,3742		1318 2 1306	3.2SPOT	01,2071	=	206 2 205
1STO2S	22,3543		1473 4 281 445	2K	4700	=	1171 3 1078 1183	3.3SPOT	01,2047		206 1 205
1TO2SUB	22,3573		1473 6 1473	2K+3	4460		374 1 374	3.5SEC	17,2022		681 1 680
1ODEGS-	23,2323		289 1 278	2NDRETRN	22,3137		406 2 406	3.5SPOT	01,2052		206
1ORTE	34,3706		881 2 858 861	2PHSCHNG	5261		1373 29 252 1036	3.7SPOT	01,2055		206
1OSECS	26,2645		756 1 756	2PI/M	16,3164		907 1 907	3/32	11,3702		1317 1 1305
1OOMST5	23,3044		538 2 537	2PISC	04,3514		1255 3 547 1262	3/4	11,3706		1317 5 32 1316
11,12	4755	=	164 1 164	2REDOSAT	43,3225		537 1 536	3/4LOWDP	11,3706	=	32
11,14,9	C6,2173		133 1 130	2RNDEND	40,3076		344	3/5	11,3670		1317 2 1305 1307
11DSPIN	40,3307		355 4 313 352	2ROUND	40,3066		344 4 341 343	3/64	11,3676		1317 1 1305
114ALM	C7,2221		221 1 222	2RTEB1	34,3716		881 4 858 870	3AXISBIT	4705	=	53
12DD	36,3763		1227 1 1225	2SATSTCK	23,3045		538 2 537	3AXISFLG	0124	=	53 5 382 610
120MRUPT	C6,2041		130 1 132	2SEC(22)	37,3363		787 1 787	3CSECS	13,3706		1296 1 1295
120MS	5660	=	154	2SECS	4735		1168 5 528 1391	3DDZ	15,3015		1043 1 1043
13-11,1	41,3710		378 1 378	2T/TCDU	4726	=	1059 1 1048	3J22R2MU	13,3750		1318 1 1307
13,14,15	7707		1170 7 161 1447	2VEXHUST	17,2004		674 1 673	3MDOT	24,2363		643 2 660 661
15/16	11,3704		1317 1 1305	2VISTO2S	22,3564		1473	3SECS	4737		1168
15ADRERS	01,2454		1161 7 1159 1163	20BIAS	40,2602		329 2 328	3ZEROS	26,3331	=	830 6 796 820
15BITADR	6221		1081 1 1087	20DEG-	23,2330		289 1 281	30RDMSK	06,2743		154 1 134
17DECML	4375	=	438	20DEGS	06,3261		160 1 159	30480RTE	34,3724		881 1 853

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SYMBOL	DEF	H	REFERENCES	SYMBOL	DEF	H	REFERENCES	SYMBOL	DEF	H	REFERENCES
33DEC	4270		366 2 366 753	4.75SPOT	01,2242		209	59MIN	42,3454		345 1 344
33OPTMON	C6,2774		155	4.77SPOT	01,2245		210	==========			
33RDMSK	4763	=	154 2 140	40/SQ2	15,3033		1043	6.11SPOT	01,2363		212
34DEC	4256		365 1 365	40/SLIN	15,3207		1046 2 1043	6.13SPOT	01,2366		212
36KFT/S	26,3003		761 1 760	4JETT	15,3756		1059 2 1053	6.2SPOT	01,2344		211 1 205
360CHECK	12,3125		1261 2 1259	4SECS	4740		1168 3 138 1059	6.3SPOT	01,2352		212 1 205
360LAMB	12,3465		1266 2 1263 1268	40CST5	24,2345		642	6.5SPOT	01,2355		212
360SW	0206	=	60 3 1259 1261	400KFT	26,3021		762 2 761	6.7SPOT	01,2360		212
360SWBIT	4712	=	60	==========				6DD	36,3762		1227 1 1225
378LANK	36,3210		848 1 845	5.11SPOT	01,2275		210	6SECTS	24,3704		688
38TRDEG	13,2314		728 1 728	5.13SPOT	01,2300		210	60GENRET	E6,1773	=	113 7 113 801
3990DEC	33,2447	=	422 1 417	5.15SPOT	01,2303		210	60SECDP	26,2646		756 1 568
==========				5.17SPOT	01,2306		210	600MS	07,3546		1406 1 1389
4.11SPOT	01,2124		207	5.2SPOT	01,2250		210 1 205	600SEC	37,2075		449 1 449
4.13SPOT	01,2127		207	5.21SPOT	01,2311		211	600SECS	13,2605		1280 2 206 1280
4.15SPOT	01,2132		207	5.23SPOT	01,2314		211	63/64+1	7675		1170
4.17SPOT	01,2135		208	5.25SPOT	01,2317		211	==========			
4.2SPOT	01,2071		207 2 205 206	5.27SPOT	01,2322		211	7/12	11,3710		1317 1 1305
4.21SPOT	01,2140		208	5.3SPOT	01,2264		210 1 205	74K	7711	=	128 1 222
4.23SPOT	01,2143		208	5.31SPOT	01,2325		211	77DECML	33,3131		433 1 425
4.25SPOT	01,2146		208	5.33SPOT	01,2330		211	==========			
4.27SPOT	01,2151		208	5.35SPOT	01,2333		211	8KK	E5,1746	=	94 6 94 593
4.3SPOT	01,2113		207 1 205	5.37SPOT	01,2336		211	8NN	E5,1747	=	94 4 94 593
4.31SPOT	01,2154		208	5.4SPOT	01,2256		210	8192AUG	07,3361		1399 1 1399
4.33SPOT	01,2157		208	5.41SPOT	01,2341		211	89TEST	40,2062		309 2 308
4.35SPOT	01,2162		208	5.5SPOT	01,2267		210	==========			
4.37SPOT	01,2165		208	5.7SPOT	01,2272		210	9/16	11,3712		1317 1 1305
4.4SPOT	01,2077		207	5/128	11,3714		1317 1 1305	9,6,4	05,3160		188 1 182
4.41SPOT	01,2170		208	5/8	13,3752		1318 3 1282 1307	9DWAAA	30,3477		601 1 601
4.43SPOT	01,2173		208	5BLANK	40,2437		314 6 314 367	9DWAAB	30,3500		601 1 601
4.45SPOT	01,2176		208	5BLANK1	40,2460		315	9DWAAC	30,3520		601 1 601
4.47SPOT	01,2201		209	5B10	01,2523		1163	9DWEPCAL	30,3370		599 2 600
4.5SPOT	01,2116		207	5DEGREES	15,2163		702 1 702	9DWEXITX	30,3572		602 1 601
4.51SPOT	01,2204		209	5SEC	24,3000		652 3 638 647	9DWEXXXA	30,3602		602 1 602
4.53SPOT	01,2207		209	5SECDP	24,2777		652 1 639	9DWFIG6	30,3436		600 1 600
4.55SPOT	01,2212		209	5SECOND	17,2024		681 2 680	9DWI	0012	=	603 11 599 602
4.57SPOT	01,2215		209	500SEC	25,2111		797 1 797	9DWI=J	30,3365		599 2 600
4.6SPOT	01,2105		207	504AZ	0022	=	1218 3 1216	9DWI=JA	30,3454		600 2 602
4.61SPOT	01,2220		209	504F	0006	=	1218 5 1214 1215	9DWIO	30,3645		603 6 555 620
4.63SPOT	01,2223		209	504LM	E4,1411		85 3 1210 1305	9DWJ	0016	=	603 12 599 602
4.65SPOT	01,2226		209	504LPL	0016	=	1218 4 1217	9DWN	0014	=	603 4 601 602
4.67SPOT	01,2231		209	504RM	13,2557		1209 1 1209	9DWN=N+3	30,3550		602 1 601
4.7SPOT	01,2121		207	504RPR	0000	=	1218 4 1210 1212	9DWNEXEP	30,3523		601 1 601
4.71SPOT	01,2234		209	540D	36,3761		1227 1 1223	9DWP	0010	=	603 7 599 601
4.73SPOT	01,2237		209	59.99SEC	42,3455		345 1 345	9DWSETI2	30,3413		600 1 600

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9DWSETJ2	30,3432	600	1 600	9DWTO6DW	30,3354	599	2 597	9DW26D	30,3643	603	4 600 602
9DWSETWX	30,3545	602	1 601	9DWXX	1214 =	603	2 599 602	90SECS	06,2764	154	2 137
9DWTESTJ	30,3417	600	1 600								

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SYMBOL	DEF	H	PAGE	SYMBOL	DEF	H	PAGE	SYMBOL	DEF	H	PAGE	SYMBOL	DEF	H	PAGE
.05GBIT	4710	=	56	BITS5-6	4730	=	524	CM/DSBIT	4711	=	56	DIMOBIT	4712	=	50
.6SECTS	24,2776		652	BITS6,8	40,3566		380	CM/DUMPR	15,3715		1057	DNENFBIT	4702	=	53
==========				BIT13-14	4371	=	1171	CM/POSE3	37,3660		838	DMPINCP2	30,3053		595
-MUDT(M)	37,3361		787	BIT1447	27,2124		383	CM/TRIO	37,3434		834	DMPINTEG	30,2375		589
==========				BLANKCHK	10,3260		1441	CMARMBIT	4677	=	54	DMPNSUB	7265		1109
ABORT	5604	=	1460	BLANKRET	0114	=	66	CMDAPARM	0135	=	54	DNLSTADR	0332	=	70
ABVAL	00,3201		1147	BMAGX	0042	=	36	CMENTR07	05,2101	=	173	DOALARM	5112	=	1459
ACCSABRT	00,3722		1158	BMAGY	0043	=	36	CMOONBIT	4677	=	58	DOBRATE?	15,2506		1032
ACROLL	17,3007		1011	BMAGZ	0044	=	36	CMTR1	37,3564		837	DODNADR	05,3347		1063
ACYCHECK	17,3115		1013	BNKCHK	43,3713		1367	CMTR2	37,3635		838	DODNCHAN	05,3415		1064
ADDRESS	6052		1076	BNKCPTN	43,3312		1361	CNGL	22,2375		396	DOTIXBR	01,2451		1160
ADERCCMP	33,3347		437	BP1(NPO)	17,2253		961	CNTCHK	27,2361		574	DRFTBIT	4674	=	46
ADRS+1	43,3622		1366	BP2(NPO)	17,2313		962	CNTRCHK	43,3463		1363	DSKYBIT	4674	=	52
ADVTKBIT	4701	=	59	BUSYMASK	10,3655		1447	COARFINE	14,3011		713	DSKYFLAG	0113	=	52
ALCGKK	33,2672		430	BY1(NYO)	17,2445		964	COFMAXGO	22,2170		392	DSPDECNR	40,3165		352
ALKCG	33,2675		430	BY2(NYO)	17,2505		965	COGAFBIT	4707	=	60	DSPLV	41,3403		353
ALLOOP3	33,2577		428	BZSTORE	20,2466		923	COMPMAT	13,2061		500	DSUMSC	20,3373		937
ALTM	0060	=	37	B12-1	4372	=	371	COMPTBIT	4703	=	53	DUMPCNIC	27,2767		1341
APSESBIT	4706	=	59	B5TOB8	01,2512		1162	COPY40.9	16,2345		677	DUMPFISH	26,3043		763
APO(EP)	17,2222		961	==========				CORFOUND	01,2661		1179	DUMPP61	26,2261		741
AP1(EP)	17,2275		962	CADRMARK	0373		71	COUNTPL	E5,1552	=	96	DUMPRPRA	27,3025		1343
AP2(EP)	17,2335		962	CALCDIR	E5,1470	=	95	CPHIBIT	4674	=	43	DUMPTFF1	27,3110		1347
AP3(EP)	17,2372		963	CALCLEM	34,3475		584	CRS61.2	34,3325		582	DUMPTFF2	27,3205		1348
ASTNBIT	4677	=	57	CALC2BIT	4711	=	48	CRS61.2A	34,3406		583	DUMPTRIG	27,2611		767
ASTNFLAG	0154	=	57	CALC3BIT	4710	=	48	CSCTOZOP	06,3130		157	DUMPVGAM	26,3072		765
ASTNV99P	24,3335		659	CD*TR*G	23,3436		1329	CULTBIT	4704	=	49	DURATION	16,3321		949
ATOPTHIS	13,2636	=	32	CDRVE	06,2012		129	CYCLEBIT	4701	=	47	DVTHRUSH	4717	=	781
ATTCHBIT	4711	=	58	CDU*NBSM	23,3567		1332	CYCLESW	0043	=	47	DXTEST	05,3223		910
ATTCHFLG	0166	=	58	CDU*SMNB	23,3554		1332	CYCLSHFT	43,3472		1364	D2J2	20,3241		935
ATTDISPR	37,2124		532	CDUANG	E5,1553	=	96	CZERO	E6,1742	=	103	D21	E6,1670	=	111
AUTOCCNT	21,3252		993	CDUFLAG	E5,1471	=	95	CZSTORE	20,2744		929	D3J3	20,3263		936
AVEGBIT	4712	=	46	CDULIMIT	E5,1453	=	95	C7TMP	E6,1725	=	104	D4J4	20,3305		936
AVEMBIT	4712	=	62	CDUNDX	E5,1546	=	96	==========				D5J5	20,3327		936
AVFLBIT	4706	=	48	CDUREADF	E5,1451	=	95	DAPT5	20,3402		938	D6J6	20,3351		937
AY0(EY)	17,2414		964	CDUREADI	E5,1452	=	95	DAP1BIT	4674	=	54	D6OR9BIT	4711	=	50
AY1(EY)	17,2467		965	CDUTIMEF	E5,1446	=	95	DAP2BIT	4675	=	54	==========			
AY2(EY)	17,2527		965	CDUTIMEI	E5,1444	=	95	DCDUINCR	21,2351		975	E/BKCALL	04,2557		411
AY3(EY)	17,2564		966	CG.CORR	16,3064		904	DEC-12	04,3462		1173	E/CALL	04,2576		412
==========				CHAN	E5,1453	=	95	DEC-6	04,3461		1173	E/JOBWAK	04,2612		413
BDZCHECK	17,3033		1011	CHKCTR	37,3006		778	DEC15	4721	=	830	E/SWITCH	04,2574		411
BEE17	04,3467		1255	CHKFAIL1	5553		1457	DEC51	07,3572		1407	EARTCNTR	14,2234		701
BESTTRIM	24,2762		651	CHKLIST	05,3355		1064	DELOGAC	16,3355		950	EBDVCNTR	24,2000		32
BHIZ	01,2477		1162	CHKSAB	14,2712		712	DELRDONE	32,2057		633	EBMARKDO	07,2000		32
BITS2-10	4746		1168	CM/ATOP	37,3562		837	DEX2	0144	=	68	EBMRKBUF	07,2001		32
BITS4,5	21,2173		972	CM/DAP2C	20,3633		1036	DFRNT	40,3267		355	EBP40TMP	24,2001		32

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SYMBOL	DEF	H	PAGE
EBRN1	37,2000		32
EGFLGBIT	4703	=	55
ELRSKIP	05,2556		182
EMSD	0055	=	37
END-E3	E3,1767	=	84
END-E4	E4,1777	=	89
END-E5	E5,1777	=	97
END-E6	E6,1776	=	113
END-UE	1377	=	80
ENDCHKG	33,2355		420
ENDDCM	22,2530	=	398
ENDGTSAL	33,3263		435
ENDHMSS	42,3521	=	346
ENDIGN	24,2647		649
ENDJETS	17,3616		1027
ENDLAMB	16,2302		677
ENDMANUV	27,2051		382
ENDMASSP	05,3266		911
ENDMRC	17,2053		897
ENDNVBSY	04,2556		374
ENDPASTE	4157		349
ENDPINBF	4526	=	375
ENDPINS2	41,3712	=	378
ENDROLL	22,3234		409
ENDRODAT	41,2315		321
ENDSLECT	17,3766	=	1030
ENDSPBIT	4676	=	54
ENDSPCCT	40,3320		356
ENDS40.6	20,2141		684
ENDTVCIN	17,2206		899
ENDVPUSH	6507		1092
ENDV97E	24,3513		662
ENDV97P	24,3433		661
ENDV97T	24,3404		660
ENDV99P	24,3351		659
ENDV99PI	24,3343		659
END2DEC	40,3210		352
ENGONBIT	4704	=	53
ENGONFLG	0123	=	53
ENG2BIT	4700	=	45
ENTPASHI	41,2012		316
EPC5RTE	34,3763		882
ERADFBIT	4676	=	45
ERASWAK1	13,3460		1291
ERASWAK2	13,3462		1291
ERMINUS	40,3544		379
EXECPHS	16,3170		915
EXTENTST	16,3623		954
==========	==========		
FAILDSP	24,3263		658
FALTOF	4404		371
FAZA1	36,3512		1224
FAZB1	36,3610		1225
FCARD1	20,3463		943
FCARD2	20,3464		943
FCARD3	20,3465		943
FCARD4	20,3466		943
FCARD5	20,3467		943
FCARD6	20,3470		943
FCSTART	30,2000	=	29
FDAIDSP1	21,2401		977
FFTAG5	6000	=	25
FFTAG9	4000	=	25
FIGTIME	35,2274		460
FIG2EXIT	30,2321		588
FINALBIT	4705	=	47
FINEK2	43,2263		236
FIRELOOK	16,3613		954
FIRSTBIT	4704	=	47
FIRST3	7707	=	552
FIXCLPAS	40,2303		312
FLAGFILL	0110		65
FLAGWRD8	0104	=	58
FLGWRD10	0106	=	62
FLGWRD11	0107	=	63
FREECHK	21,2161		972
FREEFBIT	4710	=	44
FREERET	0144	=	67
F2RTEBIT	4706	=	44
==========	==========		
GAMDIFSW	0136	=	54
GAMDV32	32,3560		876
GAMDV40	32,3573		876
GAMDV45	32,3600		876
GBIASX	E3,1460	=	81
GDTSETUP	20,2075		683
GENMARK	10,3147		1439
GEOCOMPS	E5,1643	=	97
GEORGEK	33,3707		444
GEOSAVED	E5,1631	=	96
GETANGLE	25,2217		800
GLOKFBIT	4675	=	48
GMBDRBIT	4701	=	55
GMDIFBIT	4700	=	55
GN/CCODE	4736		1168
GOAGIN	10,3176	=	1447
GODSP	10,2574		1432
GODSPR1	10,2603		1432
GODSP2	10,2575		1432
GOGOMARK	10,2536		1431
GOMARK2R	10,2507		1430
GOMARK3	10,2473		1430
GOMARK3R	10,2512		1430
GOMARS	10,2462		1430
GONEBIT	4701	=	55
GOPERFRS	10,3033		1437
GOPERFS	10,2753		1435
GOPERF2	10,2756		1435
GOXDSP	10,2461	=	1447
GOXDSPFR	10,2504	=	1447
GOXDSPR	10,2501	=	1447
GROUPKIL	04,2172		195
GRRBKBIT	4706	=	53
GTSOPNDZ	E5,1655	=	97
GTSOPTSS	33,3624		442
GTSWTLST	E5,1645	=	97
GUESS	33,2016		414
GUESSBIT	4711	=	46
GUESS1	33,2254		417
GYMDIBIT	4712	=	56
GYMDIFSW	0150	=	56
GYROCTR	0047	=	36
GYTOBETQ	E5,1472	=	95
GONBYBIT	4703	=	57
G21	E6,1672	=	111
==========	==========		
HALFNFLT	23,2267		288
HINDBIT	4705	=	56
HOLDATT	34,3470		584
==========	==========		
ICORK2	43,2166		234
IDADDTEM	0142	=	67
IDAD3TEM	0152		67
IDLEBIT	4705	=	46
IDLEFBIT	4704	=	57
IDLEFLAG	0161	=	57
IDLERET1	10,3427		1443
IGNFLAG	0153	=	57
IGNFLBIT	4676	=	57
IMMEDRET	10,3515		1445
IMPULBIT	4702	=	47
IMPULCHK	24,2567		648
IMU/OPT	E5,1450	=	95
IMUBACK	33,2033		414
IMUCAL2	06,2000	=	26
IMUGOOD	07,3440		1402
IMUSEBIT	4703	=	44
IMUTEST	33,2004		414
IMUZERO3	07,2570		1386
INCORBIT	4700	=	52
INCRCOUS	22,3607		1475
INFINBIT	4704	=	59
INRLBIT	4706	=	56
INTFLAG	0227	=	62
INTOTHIS	13,2122		501
INTVEC	E5,1476	=	96
INTYBIT	4707	=	49
INTZ	E5,1504	=	96
INVC107	32,2443		856
IRIGCOMP	06,3331		292
IRIGX	06,3333		292
IRIGY	06,3347		292
IRIGZ	06,3363		292
ISSUP	06,2323		138
ISSWOFF	06,2700		152
ISWRETRN	4646		1072
ITR0	6337		1086
ITR1	6326		1086
ITR10	6111		1077
ITR11	6151		1078
ITR12	6103		1077
ITR14	6206		1080
ITR15	6072		1077
ITR7	6230		1081
ITSWBIT	4675	=	57
==========	==========		
JAMPROG	4257		366
JSWCHBIT	4675	=	43
JZSTORE	20,2427		922
==========	==========		

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SYMBOL	DEF	H	PAGE
KBIT	4712	=	44
KEYCALL	07,2140		219
KILLJETS	16,3716		956
KNOWNBIT	4703	=	55
KPIP	37,3353		787
KRESUME2	21,3141		990
KV2	E6,1674	=	111
KV3	E6,1702	=	111
K3S1	22,2371		396
K4	22,2372		396
K4SQ	22,2373		396
==========			
LARMENT	5551		1457
LASTGTS	33,3270		436
LASTTIME	01,3500		1201
LASTXCMD	0035	=	78
LASTYCMD	0035	=	78
LATSWBIT	4707	=	56
LEMNO	05,3204		910
LEMONM	0056	=	37
LEMTEST	05,3200		910
LMOONBIT	4700	=	59
LOADDAP	24,2000	=	28
LODPMAX1	04,3465		1173
LOPC	30,2000	=	29
LOS1	E5,1454	=	95
LOS2	E5,1462	=	95
LOTEMIN	0124	=	66
LOUNITX	04,3450	=	31
LOUNITY	04,3446	=	31
LOUNITZ	04,3444	=	32
LRUPT	0011	=	36
LSTPTR	0144	=	67
LUNABIT	4677	=	49
L350	25,3533		824
==========			
MANUEXIT	34,3455		584
MANUSTAL	22,3110		406
MARKFCRM	10,2471		1430
MARKITI	07,2156		221
MASKREG	E5,1544	=	96
MASS	E6,1475	=	99
MASSBACK	24,2752		651
MAT1B1	34,3556		585
MAXDBBIT	4677	=	60
MAXIST	16,3573		953
MAXVTIM2	15,3445		1052
MDOTFAIL	37,3144		781
METHOD2	22,2210		393
MGLVFBIT	4711	=	54
MIDAVBIT	4711	=	62
MIDFLBIT	4676	=	43
MIDIFBIT	4710	=	61
MINLIMAP	16,3507		952
MINIST	16,3566		953
MKOVBIT	4710	=	52
MKOVFLAG	0110	=	52
MONITI	41,3222		347
MOONBIT	4677	=	43
MRKIDBIT	4674	=	50
MRKIDFLG	0074	=	50
MRKNVBIT	4702	=	51
MRUPTBIT	4706	=	51
MRUPTFLG	0106	=	51
MSGSCAN1	32,2000	=	30
MU(P)	0032	=	1318
MUM	13,3730	=	1318
MWAITBIT	4700	=	51
MWAITFLG	0100	=	50
M6RTE828	34,3714		881
==========			
NDCMPTST	41,2435		325
NORMSBIT	4701	=	57
NEEDLBIT	4702	=	43
NEEDLEIN	17,2155		898
NEEDLEUP	16,2706		901
NEG100	5127		1187
NEG5	41,2115		318
NEG7	5630	=	198
NETZERO	6070		1077
NEWB(S)	20,2545		925
NEWC(S)	20,3023		931
NEWIBIT	4676	=	58
NEWJ(S)	20,2556		925
NEWY(S)	20,3034		931
NEXBNKSS	33,3557		442
NEXTBNKS	33,3540		441
NJETSBIT	4674	=	44
NO.13-15	16,3651		954
NO.16-14	16,3672		955
NOBITS	E5,1452	=	95
NODOBIT	4712	=	48
NOGOM2	22,2725		402
NOMONLST	05,2113	=	165
NORESET	07,3232		1396
NORFBIT	4700	=	43
NORFINAL	13,3255		1288
NORMTEST	00,3511		1153
NORMUNX1	22,3721		1478
NOSAM	15,2376		734
NOSWBIT	4704	=	55
NOUPDATE	16,2740		902
NPDNODE	17,2226		961
NP2NODE	17,2310		962
NP3NODE	17,2350		963
NRMIDBIT	4676	=	50
NRMIDFLG	0076	=	50
NRMNVBIT	4703	=	51
NRUPTBIT	4707	=	52
NRUPTFLG	0107	=	52
NSUMSC	20,3213		935
NTARGBIT	4710	=	56
NTRYPRIO	4675	=	795
NUFAZ+10	4126		214
NUVLEM	E3,1652		83
NVSBWAIT	4461		374
NVSUBCOM	4204		362
NWAITBIT	4701	=	51
NWAITFLG	0101	=	51
NXXTBNN	33,3137		434
NYDNODE	17,2420		964
NY2NODE	17,2502		965
NY3NODE	17,2542		966
N2217BIT	4705	=	61
==========			
OCTL700	30,2171		555
OCT00010	4707	=	197
OCT00060	21,3020		987
OCT00300	21,3021		987
OCT10000	4676	=	184
OCT10001	7632	=	1171
OCT1103	5645		1459
OCT12	4377	=	642
OCT140	4733	=	1171
OCT203	37,2332		552
OCT217	5651		1459
OCT25	4376	=	1171
OCT30000	4371	=	184
OCT30002	6440	=	1171
OCT35	24,2356		643
OCT40420	10,3664		1448
OCT53	24,2355		643
OCT67777	10,3663		1448
OCT7777	05,2723		184
OC40200	27,2473		575
OGF	E6,1702	=	111
OLDAZ1	E5,1637	=	97
OLDBODY1	E6,1503	=	112
OLDBODY2	E6,1504	=	112
OLDBODY3	E6,1505	=	112
OMEGACLC	16,2254		674
OMEGAXB	E6,1533	=	100
OMEGAXC	E6,1525	=	100
ONCEMORE	33,3041		432
ONESEK	21,2143		971
OPDEGIN2	40,3007		342
OPFAILON	06,3235		160
OPTNREG	E5,1473	=	95
OPTVARKP	20,2435		922
OPTVARKY	20,2713		928
OPTX	0036	=	36
OPTXCMD	0054	=	37
OPTYCMD	0053	=	37
ORBWFBIT	4705	=	49
ORDERBIT	4705	=	59
ORIG	E4,1673	=	86
OTHSHIP	23,2423		505
OUTLINK	0057	=	37
OVERNOUT	25,3571		824
==========			
PACLIM	20,2451		923
PBIASY	E3,1454		81
PBIASZ	E3,1456		81
PCDUDCTS	20,2341		921
PCOPYCYC	20,2542		924
PDAPEND	20,2543		924
PDLADDER	20,2503		923
PDSPFBIT	4677	=	50
PDSUMC	20,2522		924
PERFCHEK	10,3263		1441

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SYMBOL	DEF	H	PAGE
PERFERAS	33,3035		432
PERORLIM	20,2401		922
PFORWARD	20,2410		922
PFRATBIT	4707	=	48
PHASE2	0755		72
PHASE3	0757		72
PHASE4	0761		72
PHASE6	0765		72
PHSBB1	E3,1437		81
PHSBB2	E3,1441		81
PHSBB3	E3,1443		81
PHSBB4	E3,1445		81
PHSBB5	E3,1447		81
PHSBB6	E3,1451		81
PHSCHK2	16,3242		916
PHSNAME2	E3,1440		81
PHSNAME3	E3,1442		81
PHSNAME4	E3,1444		81
PHSNAME6	E3,1450		81
PINBRBIT	4705	=	51
PINTEGRL	20,2353		921
PINTEST	43,2002	=	376
PIPASCFY	E3,1455		81
PIPASCFZ	E3,1457		81
PIPUSE1	07,3101		1393
PITCHANG	0026	=	885
PMISC	20,2575		925
PNLADDER	20,2471		923
PNSUMC	20,2502		923
POINT2	26,3153		830
PON4	33,2237		417
POODAPAD	04,2372		198
POOH	04,2146		194
POS-2.5	24,3701		688
POS1/4	11,3700	=	1317
POUT	20,2452		923
PREBJUMP	5250		1368
PREC1BIT	4703	=	49
PREC150	32,2562		859
PREC170	32,2645		860
PREC205	32,2747		861
PRFTRBIT	4701	=	53
PRIODBIT	4675	=	50
PRIODFLG	0075	=	50
PRIO11	4757		1169
PRIO2	4700	=	1171
PRIO23	7660		1169
PRIO34A	7671	=	971
PRIO36	7673		1169
PROCEEDE	06,2075		131
PROCESSW	06,3023		155
PROG22C	30,2151		555
PRONVBIT	4704	=	51
PROUND	20,2444		922
PSTROKER	20,2335		921
PULSEM	15,2207		711
PUTXY	41,2710		336
PUTXYZ	41,2626		335
P1FILJMP	20,2402		922
P17.3	35,3504		548
P2FILJMP	20,2460		923
P20R52J8	37,2321		552
P21	66,1666	=	111
P22MKBIT	4700	=	49
P22OVER	30,2156		555
P30PHSI	35,3555		624
P30S	35,2000	=	30
P37N	36,3027		845
P39SWBIT	4702	=	59
P40CLK	24,2264		641
P40GMB	24,2060		638
P40MINDB	24,2171		640
P40PVA	24,2023		637
P40SXTY	24,2032		637
P40TSK	24,2401		643
P40TTCG	24,2044		637
P47/DSP	24,2476		645
P47BOD	24,2471		645
P51FIVE	4715	=	721
P52E	15,2135		693
P62.3CAD	26,2401		745
P67.3	26,2540		753
==========			
QUICKIGN	24,3474		662
QUITBIT	4706	=	61
==========			
RANGER	25,2563		810
RANGERD1	27,2435		575
RATEDEN	16,3464		952
RATENUM	16,3500		952
RATEZRO	20,2003		674
RCSADDR4	04,2400		199
RCSCADR	24,3702		688
RDAPEND	16,3711		955
RDM	13,3762		1318
RDSP	E5,1444	=	96
READPIPS	22,3524		1472
RECAL3	40,3476		369
REDOMANN	27,2002		381
REFLASHR	10,2613		1432
REFSMBIT	4676	=	49
REGION6	16,3434		951
REG1TST	16,3370		950
REG2TST	16,3420		950
REG3TST	16,3376		950
REG4TST	16,3424		951
REG5TST	16,3433		951
RELVBIT	4702	=	55
RENDGUID	23,2000	=	28
RENDISP4	34,3215		573
RENDWBIT	4712	=	54
REPLACEP	17,3733		1030
REPLACEY	17,3742		1030
REQEXLOC	41,2207		319
RMM	04,2533		202
RNDVZBIT	4704	=	44
ROLLPREP	16,2670		901
ROO	04,2127		194
RPAD1	22,3310	=	1352
RPQFLBIT	4674	=	58
RRECT1	0022	=	82
RSTPAF	34,3623		606
RSTRTST	20,2067		683
RTBCODE1	22,2000	=	28
RTENCK3A	32,3102		865
RTE299	36,2517		841
RTE320	36,2556		842
RTE505	36,2751		844
RTE625	36,2770		845
RUPTSTOR	0063	=	65
RVSWBIT	4702	=	57
RWORD	17,2776		1011
R21BIT	4675	=	46
R21CSM1	37,2523		561
R22CABIT	4704	=	61
R22CAFLG	0217	=	61
R23.END	31,2526		615
R23.8	31,2522		615
R23BIT	4702	=	45
R30OK	27,3331		1352
R31FLBIT	4707	=	61
R51.2	14,2527		708
R52A	14,2017		696
R52I	14,2116		697
R53FLBIT	4705	=	44
R53OUT	14,3406		724
R55.1	15,2210		711
R57BIT	4703	=	55
R60FLBIT	4707	=	53
R61C1	37,2556		562
==========			
S+2	4711	=	1359
S+3	6214	=	1359
S+4	4710	=	1359
S+5	4715	=	1359
S+6	6211	=	1360
S-2	7715	=	1360
S-3	7714	=	1360
S-4	8061	=	1360
SAMEJETS	16,3637		954
SAVE	E5,1474	=	95
SAVECBIT	4701	=	61
SAVEFLAG	1071	=	1447
SBIT1	4712	=	1359
SBIT10	4701	=	1359
SBIT13	4676	=	1359
SBIT14	4675	=	1359
SBIT2	4711	=	1359
SBIT3	4710	=	1359
SBIT5	4706	=	1359
SBIT6	4705	=	1359
SBIT8	4703	=	1359
SD	22,2370		396
SECAD	22,2016		390
SELFSUPR	40,2000	=	31
SETCLOCK	24,3211		656
SETMARK	10,2654		1433
SETPRIO	10,2636		1433
SETUPGC	33,3156		434
SFCONST1	E5,1477	=	95

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SYMBOL	DEF	H	PAGE
SFRET	41,3057		338
SFRET1	41,3041		338
SHAFTA	1161	=	95
SHAXIS	14,2153		698
SHORTMP2	7262		1108
SIDETRAK	25,2710		812
SIGNRET	0125	=	66
SIM2CADR	05,2354		178
SINB	E5,1675	=	92
SLOPEBIT	4710	=	46
SNAPAGN	05,3456		1065
SNAPEND	05,3475		1066
SNGLCD	22,2374		396
SOLNSBIT	4710	=	54
SOLPOS	26,2123		738
SOMEERRR	33,3101		433
SOPTION2	43,3320		1361
SOPTION3	43,3321		1361
SOPTION4	43,3322		1361
SOPTION5	43,3323		1361
SOPTION6	43,3324		1361
SOPTION7	43,3325		1361
SOPTION10	43,3326		1361
SOUPLY	33,3125		433
SOURCBIT	4703	=	61
SPBIT1	16,2131		672
SPITGYRO	33,3363		437
SPSCODE	4702	=	1384
SPSON	24,2564		648
SPVQUIT	37,3420		833
SQRARG	1077		74
STARTMNV	27,2047		382
STARTSIM	05,2352		178
STARTSTO	6403		1089
STARTSW	05,2351		178
STATEBIT	4706	=	49
STATEST	35,3204	=	32
STBYDUMP	15,2674		1040
STEERBIT	4700	=	47
STIKBIT	4675	=	45
STORHAPO	23,2716		511
STORHPER	23,2730		512
STORT	34,3234		581
STRKCALL	16,3041		904
STRULBIT	4676	=	54
SUPER100	4704	=	1168
SURFFBIT	4703	=	59
SWTCVBIT	4674	=	60
SWTCVER	0207	=	60
SXTCPTN	E5,1413	=	95
S2BVTRS	30,3005		594
S2GETUM	30,2373		589
S2INCP1	30,3011		594
S2INTS1	30,2702		593
S2RPTR	30,2743		594
S2RTRP	30,2735		593
S22F244	30,3127		596
S52.2.1	11,2277		725
S52/3	15,2000	=	27
==========	==========		==========
TARG1BIT	4701	=	45
TARG2BIT	4702	=	45
TBASE3	1057		73
TBUILDFX	4724		1168
TCALARM2	43,3261		1360
TCCSM	E3,1622		83
TCLEM	E3,1674		83
TDECAYFX	4725		1168
TEMP	E5,1451	=	95
TEMPADD	E5,1450	=	95
TERMIBIT	4674	=	56
TESTVB	41,2041		317
TETOTHER	E3,1642	=	83
TET1	0036	=	82
TFFSWBIT	4712	=	58
TFFTICK	23,2554		507
TGOCALC	16,2175		673
THRUST	0055	=	37
TICKTPER	23,2511		506
TIMER	E5,1500	=	96
TIMETST	15,3537		1054
TIMRBIT	4700	=	57
TMANUCHK	22,3105		406
TMEXITL	05,3527		1066
TMODE	6446		1091
TMRESUME	05,3531		1066
TOLDAZMT	E5,1641	=	97
TOLDAZ1	E5,1641	=	97
TORQINCH	33,3064		432
TRACE1	40,3141		351
TRACE1S	40,3152		351
TRACKBIT	4706	=	46
TRG*SMNB	23,3557		1332
TRTAGXPI	15,3307		1049
TRUNA	1160	=	95
TRUNBIT	4707	=	44
TRUN19A	31,3036		619
TSSR	00,2025		1119
TSTPOINT	23,3663		1335
TVCDTCHK	20,3432		942
TVCINIT2	17,2102		897
TVCINIT3	17,2145		898
TVCTMP1	E6,1523	=	100
T5RPTBB	4064		127
T6ADR	1311		78
==========	==========		==========
UPDATBIT	4704	=	45
UPDATE1	27,2000	=	29
UPDNLIST	05,2214	=	165
UPDTMEND	43,2361		239
UPEND73	27,3472		1467
UPERCMC	43,3755		1464
UPERLEM	43,3751		1464
UPLOCBIT	4707	=	58
UPLOCKFL	0164	=	58
UPOK	07,3667		1414
UPPART3	27,3516	=	1467
UPRPT1	07,3650		1414
UPWAKE	27,3510		1467
==========	==========		==========
V(24K)	32,2226		635
V(28K)	32,2222		635
VACSTOR	07,2243		222
VACZ	E4,1630	=	86
VAC1	0401		71
VAC2	0455		71
VAC3	0531		71
VAC4	0605		71
VARSUBL3	31,3042		620
VCVLEM	E3,1666		83
VECSGNAG	22,3767		1479
VECSHIFT	22,3412		489
VEHUPBIT	4703	=	45
VERIFBIT	4710	=	58
VERIFLAG	0165	=	58
VERTDRFT	33,2227		417
VFLAGBIT	4701	=	49
VHFRBIT	4702	=	61
VINTFBIT	4710	=	50
VLAUNS	E5,1472	=	96
VLTEST	25,3051		815
VPDVL	6542		1093
VRECTCSM	E3,1562		83
VRECTLEM	E3,1634		83
VRECT1	0030	=	82
VSTORE	6412		1089
VV/SC	7576		1117
VVXSC	7353		1112
V06N07	10,3625		1447
V06N30S	06,3540		296
V06N45	35,3725		627
V06N89	30,2167		555
V06N89A	14,2152		698
V16N35	35,3724		627
V37FLBIT	4705	=	58
V37XEQC	04,2310		197
V59FLBIT	4677	=	52
V67FLBIT	4675	=	60
V74	43,2710	=	253
V82EMBIT	4676	=	60
V94FLBIT	4700	=	60
V99EJOB	24,3320		659
V99FLASH	24,3502		662
V99TJOB	24,3326		659
==========	==========		==========
WAIT1/2	16,3332		949
WCALC	22,2740		403
WHICHALF	15,3337		1050
WPLATI	E5,1570	=	96
WPLATO	E5,1474	=	96
WRDRET	0115	=	66
WRTN22	21,3165		990
==========	==========		==========
XACTALM	43,2120		231
XACTO	43,2122		231
XDELVBIT	4704	=	47
XDSPBIT	4712	=	52
XDSPFLAG	0112	=	52
XKEPCSM	E3,1624		83
XKEPLEM	E3,1676		83

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SYMBOL	DEF	H	PAGE
XPRODUCT	16,2237		674
==========			
YACLIM	20,2727		928
YCOPYCYC	20,3020		930
YDAPEND	20,3021		930
YDLADDER	20,2761		929
YDSUMC	20,3000		929
YERORLIM	20,2657		927
YFORWARD	20,2666		928
YINTEGRL	20,2631		927
YMISC	20,3053		931
YNLADDER	20,2747		929
YNSUMC	20,2760		929
YOUT	20,2730		928
YROUND	20,2722		928
YSTROKER	20,2625		927
YWORD	17,2725		1009
YZSTORE	20,2705		928
Y1FILJMP	20,2660		927
Y2FILJMP	20,2736		929
==========			
ZERINFLT	23,2265		288
ZEROCMDS	21,3737		1004
ZEROOP	04,3452	=	1173
ZEROO	26,3331	=	1227
ZMEASBIT	4701	=	43
ZOPALARM	06,3041		156
ZRUPT	0015	=	36
==========			
0EBANK	43,3336		1362
==========			
1.11SPOT	01,2025		205
1.15SPOT	01,2017		205
1.17SPOT	01,2022		205
1/MINLIM	16,3727		957
1RTEB12	34,3666		881
1RTEB25	34,3674		881
1RTEB4	34,3662		881
1SECXT	05,1644	=	97
120MS	5660	=	154
17DECML	4375	=	438
17TO20	43,3640		1366
==========			
2.11SPOT	01,2041		206
2.13SPOT	01,2044		206
2.5SEC	37,3143		781
2.5SPOT	01,2033		206
2.7SPOT	01,2036		206
2DEGRES	33,3711		444
2DZERO	04,3452	=	1207
2RNDEND	40,3076		344
2V1STO2S	22,3564		1473
22DSPBIT	4676	=	47
27TO30	43,3646		1366
==========			
3.11SPOT	01,2060		206
3.13SPOT	01,2063		206
3.15SPOT	01,2066		206
3.5SPOT	01,2052		206
3.7SPOT	01,2055		206
3/4LOWDP	11,3706	=	32
3AXISBIT	4705	=	53
3SECS	4737		1168
33OPTMON	06,2774		155
360SWBIT	4712	=	60
==========			
4.11SPOT	01,2124		207
4.13SPOT	01,2127		207
4.15SPOT	01,2132		207
4.17SPOT	01,2135		208
4.21SPOT	01,2140		208
4.23SPOT	01,2143		208
4.25SPOT	01,2146		208
4.27SPOT	01,2151		208
4.31SPOT	01,2154		208
4.33SPOT	01,2157		208
4.35SPOT	01,2162		208
4.37SPOT	01,2165		208
4.4SPOT	01,2077		207
4.41SPOT	01,2170		208
4.43SPOT	01,2173		208
4.45SPOT	01,2176		208
4.47SPOT	01,2201		209
4.5SPOT	01,2116		207
4.51SPOT	01,2204		209
4.53SPOT	01,2207		209
4.55SPOT	01,2212		209
4.57SPOT	01,2215		209
4.6SPOT	01,2105		207
4.61SPOT	01,2220		209
4.63SPOT	01,2223		209
4.65SPOT	01,2226		209
4.67SPOT	01,2231		209
4.7SPOT	01,2121		207
4.71SPOT	01,2234		209
4.73SPOT	01,2237		209
4.75SPOT	01,2242		209
4.77SPOT	01,2245		210
40/SQZ	15,3033		1043
40CST5	24,2345		642
==========			
5.11SPOT	01,2275		210
5.13SPOT	01,2300		210
5.15SPOT	01,2303		210
5.17SPOT	01,2306		210
5.21SPOT	01,2311		211
5.23SPOT	01,2314		211
5.25SPOT	01,2317		211
5.27SPOT	01,2322		211
5.31SPOT	01,2325		211
5.33SPOT	01,2330		211
5.35SPOT	01,2333		211
5.37SPOT	01,2336		211
5.4SPOT	01,2256		210
5.41SPOT	01,2341		211
5.5SPOT	01,2267		210
5.7SPOT	01,2272		210
5BLANK1	40,2460		315
5B10	01,2523		1163
==========			
6.11SPOT	01,2363		212
6.13SPOT	01,2366		212
6.5SPOT	01,2355		212
6.7SPOT	01,2360		212
6SECT5	24,3704		688
63/64+1	7675		1170

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED = DEFINED BY EQUALS J DEFINED BY JOKER OR ERASE ANYWHERE MD MULTIPLY DEFINED
BD BADLY DEFINED CD DEFINITION ASSOCIATED WITH CONFLICT XX MISCELLANEOUS TROUBLE

ERASABLE & EQUALS CROSS-REFERENCE TABLE SHOWING DEFINITION, PAGE OF DEFINITION, AND SYMBOL

DEF	PAGE	SYMBOL	DEF	PAGE	SYMBOL	DEF	PAGE	SYMBOL	DEF	PAGE	SYMBOL	DEF	PAGE	SYMBOL
0000	36	A	0010	36	ARUPT	0016	1272	CDGAMAX	0026	70	PDA	0035	201	NO.MMS
0000	43	CPHIFLAG	0010	38	OUTO	0016	1273	MAX	0026	70	ZPRIME	0036	36	CDUS
0000	79	DISPDEX	0010	44	RNDVZFLG	0016	1318	RATT1	0026	116	GAMMA11	0036	36	OPTX
0000	202	COSTALIN	0010	603	9DWP	0016	1318	URPV	0026	885	PITCHANG	0036	46	DRIFTFLG
0000	603	WORKW	0010	885	UR	0016	1337	CDELF/2	0026	1273	ITERCTR	0036	82	TET1
0000	891	UZZ	0010	1208	GAMRP	0016	1337	TFFQ1	0026	1337	TFF1/ALF	0036	603	S22D
0000	1218	504RFR	0010	1218	CVECTR	0016	1343	RPER	0027	36	TIME4	0036	1272	T
0000	1318	RATT	0010	1218	DVECTR	0017	36	BRUPT	0027	45	UPDATFLG	0036	1273	DEP
0001	36	L	0010	1218	SINNODI	0017	44	NJETSFLG	0030	36	TIME5	0036	1337	TFF/RTMU
0001	38	LCHAN	0010	1271	ALPHA	0020	36	CYR	0030	38	CHAN30	0037	36	PIPAX
0001	43	JSWITCH	0010	1272	CDGAMIN	0020	44	STIKFLAG	0030	46	IDLEFAIL	0037	46	R21MARK
0001	202	ENTRYUPD	0010	1273	MIN	0020	70	CDSTH	0030	82	VRECT1	0040	36	PIPAY
0002	36	Q	0011	36	LRUPT	0020	702	CSUN	0030	124	RPRE	0040	47	22DSPFLG
0002	38	QCHAN	0011	38	DSALMOUT	0020	1271	ROOTMU	0030	603	S221X3	0040	70	STARM
0002	43	MIDFLAG	0011	44	R53FLAG	0020	1337	NRTERM	0030	1272	XI	0040	603	S22RHO
0002	202	RENDEZVU	0012	36	GRUPT	0020	1343	RAPO	0030	1273	COSF	0040	1218	COB
0002	885	R	0012	38	CHAN12	0021	36	SR	0030	1337	TFFRTALF	0040	1272	R1
0002	885	RCM	0012	44	F2RTE	0021	45	ERADFLAG	0031	36	TIME6	0040	1318	TDEC1
0002	891	JCCUNT	0012	603	9DWI	0022	36	CYL	0031	38	CHAN31	0040	1337	NRMAG
0003	36	EBANK	0012	1271	XMAX	0022	70	SINTH	0031	46	TRACKFLG	0041	36	PIPAZ
0003	38	HISCALAR	0012	1337	TFFDELQ	0022	82	RRECT1	0032	36	CDUX	0042	36	BMAGX
0003	43	MODFLAG	0013	36	SAMPTIME	0022	603	S223X1	0032	38	CHAN32	0042	37	LVSQUARE
0003	202	POWERED	0013	38	CHAN13	0022	702	CMOON	0032	46	TRM03FLG	0042	47	STEERSW
0004	36	FBANK	0013	44	TRUNFLAG	0022	891	UNN	0032	125	P/RPRE	0042	1218	SOB
0004	38	LOSCALAR	0014	38	CHAN14	0022	1218	504AZ	0032	453	DELELO	0042	1272	KEPC1
0004	43	NORMOR	0014	44	FREEFLAG	0022	1271	1/ROOTMU	0032	1218	BVECTR	0042	1337	TFFX
0004	202	P22DNLST	0014	603	9DWN	0022	1318	COSPHI/2	0032	1272	S(XI)	0043	36	BMAGY
0005	36	Z	0014	891	UW	0022	1337	RTERM	0032	1318	MU(P)	0043	47	CYCLESW
0005	38	PYJETS	0014	1272	DCDGA	0023	36	EDOP	0032	1318	TVEC	0044	36	BMAGZ
0005	43	ZMEASURE	0014	1272	XMIN	0023	45	ENG2FLAG	0032	1337	TFFALFA	0044	37	LV
0005	891	KCCUNT	0014	1273	DELINDEP	0024	36	TIME2	0033	36	CDUY	0044	47	IMPULSW
0005	971	CHAN5	0014	1318	TAT	0024	45	TARG1FLG	0033	38	CHAN33	0044	1272	KEPC2
0006	36	BBANK	0014	1337	RMAG1	0024	70	THETA	0033	46	SLOPESW	0044	1337	TFFTEM
0006	38	ROLLJETS	0015	36	ZRUPT	0024	885	YAWANG	0034	36	CDUZ	0045	36	INLINK
0006	43	NEEDLFLG	0015	38	MNKEYIN	0024	1218	AVECTR	0034	38	DNTM1	0045	47	XDELVFLG
0006	603	XTMP1	0016	36	BANKRUPT	0024	1218	MMATRIX	0034	46	GUESSW	0046	36	RNRAD
0006	891	LRR	0016	38	NAVKEYIN	0024	1272	X	0034	125	R/APRE	0046	37	X1
0006	971	CHANG	0016	44	KFLAG	0024	1318	UZ	0034	1272	XSQC(XI)	0046	47	ETPIFLAG
0006	1218	504F	0016	603	9DWJ	0024	1318	VATT1	0034	1337	TFFNP	0046	47	FIRSTFLG
0006	1318	VATT	0016	702	CEARTH	0024	1337	TFFVSQ	0035	36	CDUT	0046	47	OPTNSW
0006	1375	BB	0016	707	CSS	0025	36	TIME1	0035	36	OPTY	0047	36	GYROCMD
0007	38	SUPERBNK	0016	885	URP	0025	45	R23FLG	0035	38	DNTM2	0047	36	GYROCTR
0007	43	IMUSE	0016	1218	TIMSUBM	0025	45	TARG2FLG	0035	46	AVEGFLAG	0047	37	X2
0007	165	ERASZERO	0016	1218	504LPL	0026	36	TIME3	0035	78	LASTXCMD	0047	48	FINALFLG
0007	165	SPARE	0016	1271	1/MU	0026	45	VEHUPFLG	0035	78	LASTYCMD	0050	36	CDUXCMD

ERASABLE & EQUALS CROSS-REFERENCE TABLE SHOWING DEFINITION, PAGE OF DEFINITION, AND SYMBOL

DEF	PAGE	SYMBOL	DEF	PAGE	SYMBOL	DEF	PAGE	SYMBOL	DEF	PAGE	SYMBOL	DEF	PAGE	SYMBOL
0050	37	S1	0064	65	LCCCTR	0104	58	FLAGWRD8	0124	53	3AXISFLG	0141	55	R57FLAG
0050	48	AVFLAG	0064	65	WAITTEMP	0105	51	PINBRFLG	0124	66	CODE	0141	67	DSREL
0050	1218	RPREXIT	0064	1375	TEMPBB	0105	60	FLAGWRD9	0124	66	LOTEMIN	0141	67	POLYRET
0050	1273	TWEEKIT	0065	49	CULTFLAG	0106	51	MRUPTFLG	0124	66	SFTEMP2	0141	67	TEM1
0051	36	CDUYCMD	0065	65	ITEMP5	0106	62	FLGWRD10	0125	53	GRRBKFLG	0142	55	NOSWITCH
0051	37	S2	0065	65	NEWLOC	0106	62	RASFLAG	0125	66	MIXTEMP	0142	67	DSMAG
0051	48	PFRATFLG	0065	1375	TEMPSW	0107	52	NRUPTFLG	0125	66	SIGNRET	0142	67	IDADDTEM
0051	1209	SETREX	0066	49	ORBWFLAG	0107	63	FLGWRD11	0126	53	R60FLAG	0142	67	TEM2
0051	1218	EARTHMXX	0066	65	ITEMP6	0110	58	[illegible]	0127	53	SOLNSW	0142	68	DEXDEX
0052	37	CDUZCMD	0066	1375	TEMPSW2	0110	65	FLAGFILT	0130	54	MGLVFLAG	0143	55	HIND
0052	37	QPRET	0067	49	STATEFLG	0112	52	XDSPFLAG	0130	66	BUF	0143	67	COUNT
0052	48	CALCMAN3	0067	65	NEWJCB	0113	52	DSKYFLAG	0130	66	INDEXLOC	0143	67	TEM3
0053	37	CDUTCMD	0070	49	INTYPFLG	0114	66	BLANKRET	0130	66	SWWORD	0143	68	DEXI
0053	37	OPTYCMD	0070	65	RUPTREG1	0114	66	DSEXIT	0131	54	RENDWFLG	0143	68	DEXI
0053	37	TVCYAW	0070	1375	TEMPPR	0114	66	EXITEM	0131	67	SWBIT	0144	56	INRLSW
0053	48	CALCMAN2	0071	50	VINTFLAG	0114	66	INTB15+	0132	54	DAPBIT1	0144	67	DSPWDRET
0054	37	CDUSCMD	0071	65	RUPTREG2	0115	66	DECRET	0133	54	DAPBIT2	0144	67	FREERET
0054	37	OPTXCMD	0071	1375	TEMPG2	0115	66	INTBIT15	0133	66	BUF2	0144	67	LSTPTR
0054	37	TVCPITCH	0072	50	D6GR9FLG	0115	66	WDRET	0133	68	TERM1TMP	0144	67	RELRET
0054	48	NCDCFLAG	0072	65	RUPTREG3	0115	66	WRDRET	0134	54	ENTRYDSP	0144	67	SEPMNRET
0055	37	EMSD	0072	1375	TEMPP2	0115	66	21/22REG	0134	54	STRULLSW	0144	67	SEPSCRET
0055	37	THRUST	0073	50	DIMOFLAG	0116	52	V59FLAG	0135	54	CMDAPARM	0144	67	TEM4
0056	37	LEMCNM	0073	65	DSRUPTEM	0116	66	ADDRWD	0135	67	DMPNTEMP	0144	68	DEX2
0056	48	CLOCKFAIL	0073	65	KEYTEMP1	0117	52	INCORFLG	0135	67	MPTEMP	0145	56	LATSW
0057	37	CDTILINK	0073	65	RUPTREG4	0117	66	CHAR	0136	54	GAMDIFSW	0145	67	NOUNADD
0057	48	REFSMFLG	0073	1375	TEMPBBCN	0117	66	DECOUNT	0136	67	DOTINC	0145	67	TEM5
0060	37	ALTM	0074	43	FLAGWRD0	0117	66	ERCNT	0136	67	DVSIGN	0145	68	RTNSAVER
0060	49	LUNAFLAG	0074	50	MRKIDFLG	0117	66	POLISH	0136	67	ENTRET	0146	56	.05GSW
0061	49	P22MKFLG	0074	65	STATE	0117	66	UPDATRET	0136	67	ESCAPE	0146	56	NTARGFLG
0061	65	EXECTEM1	0075	44	FLAGWRD1	0120	53	PRFTRKAT	0136	316	ENTEXIT	0146	67	NNADTEM
0061	65	ITEMP1	0075	50	PRIODFLG	0120	53	RNGSCFLG	0137	55	GMBDRVSW	0147	56	CM/DSTBY
0061	65	WAITEXIT	0076	46	FLAGWRD2	0120	66	FIXLOC	0137	55	GONEPAST	0147	67	NNTYPTEM
0061	1375	TEMPC	0076	50	NRMIDFLG	0121	53	DMENFLG	0137	67	DOTRET	0150	56	GYMDIFSW
0062	49	VFLAG	0077	48	FLAGWRD3	0121	66	OVFIND	0137	67	OVNORMCT	0150	67	IDAD1TEM
0062	65	EXECTEM2	0077	50	PDSPFLAG	0122	53	COMPUTER	0137	67	ESCAPE2	0151	56	TERMIFLG
0062	65	ITEMP2	0100	50	FLAGWRD4	0122	66	DECTEM	0137	67	INREL	0151	67	IDAD2TEM
0062	65	WAITBANK	0100	50	MWAITFLG	0122	66	DISTEM	0137	67	WDCNT	0152	57	ITSWICH
0062	1375	TEMPF	0101	51	NWAITFLG	0122	66	NOUNTEM	0140	55	RELVELSW	0152	67	IDAD3TEM
0063	65	ITEMP3	0101	52	FLAGWRD5	0122	66	SGNON	0140	67	DSPMMTEM	0153	57	IGNFLAG
0063	65	NEWPRIO	0102	51	MRKNVFLG	0122	66	VBUF	0140	67	MATINC	0153	68	RUTMXTEM
0063	65	RUPTSTOR	0102	54	FLAGWRD6	0123	53	ENGONFLG	0140	67	MAXDVSW	0154	57	ASTNFLAG
0063	65	WAITADR	0102	795	CM/FLAGS	0123	66	HITEMIN	0140	67	MIXBR	0154	69	MPAC
0063	1375	TEMPMM	0103	51	NRMNVFLG	0123	66	NVTEMP	0140	67	POLYCNT	0154	1291	STALTEM
0064	49	PRECIFLG	0103	56	FLAGWRD7	0123	66	SFTEMP1	0141	55	EGSW	0154	1383	TEMPPHS
0064	65	ITEMP4	0104	51	PRONVFLG	0123	66	SGNOFF	0141	55	KNOWNFLG	0154	1448	FACEREG

ERASABLE & EQUALS CROSS-REFERENCE TABLE SHOWING DEFINITION, PAGE OF DEFINITION, AND SYMBOL

DEF	PAGE	SYMBOL	DEF	PAGE	SYMBOL	DEF	PAGE	SYMBOL	DEF	PAGE	SYMBOL	DEF	PAGE	SYMBOL
0155	57	TIMRFLAG	0211	60	V82EMFLG	0335	70	DNTMGOTO	0750	71	COSCDUX	1041	73	VERBSAVE
0155	1383	TEMP2G	0212	60	MAXDBFLG	0336	70	DUMPLOC	0752	72	-PHASE1	1042	73	CADRSTOR
0155	1448	PLAYTEM1	0213	60	V94FLAG	0336	70	TMINDEX	0753	72	PHASE1	1043	73	DSPLIST
0156	57	NORMSW	0214	61	SAVECFLG	0336	1066	DNECADR	0754	72	-PHASE2	1044	73	EXTVBACT
0156	1383	PCINTER	0215	61	VHFRFLAG	0337	70	DNQ	0755	72	PHASE2	1045	73	DSPTEM1
0157	57	RVSW	0216	61	SCURCFLG	0337	1066	SUBLIST	0756	72	-PHASE3	1045	73	NORMTEM1
0157	1383	TEMPSWCH	0217	61	R22CAFLG	0340	70	DNTMBUFF	0757	72	PHASE3	1050	73	DSPTEM2
0157	1447	COPMFAC	0220	61	N22ORN17	0354	70	MKNDX	0760	72	-PHASE4	1051	73	DSPTEMX
0157	1448	PLAYTEM3	0221	61	QUITFLAG	0355	70	MKT2T1	0761	72	PHASE4	1051	73	OPTIONX
0160	57	GONEBY	0222	61	R31FLAG	0357	70	MKCDUY	0762	72	-PHASE5	1053	73	TBASE1
0160	1447	TEMPCR2	0223	61	MID1FLAG	0360	70	MKCDUS	0763	72	PHASE5	1054	73	PHSPRDT1
0160	1448	PLAYTEM4	0224	62	MIDAVFLG	0361	70	MKCDUZ	0764	72	-PHASE6	1055	73	TBASE2
0161	57	IDLEFLAG	0225	62	AVEMIDSW	0362	70	MKCDUT	0765	72	PHASE6	1056	73	PHSPRDT2
0161	1447	OLTHERE	0227	62	INTFLAG	0363	70	MKCDUX	0766	72	CDUSPOT	1057	73	TBASE3
0162	57	V37FLAG	0236	63	REINTFLG	0364	70	EBUF2	0766	72	CDUSPOTY	1060	73	PHSPRDT3
0162	329	MPAC+6	0300	69	COMPNUMB	0366	71	RESTREG	0770	72	CDUSPOTZ	1060	198	MMTEMP
0162	1448	GENMASK	0300	69	QMAJ	0367	71	NVWORD	0772	72	CDUSPOTX	1061	73	TBASE4
0163	69	MODE	0301	69	MARKINDX	0370	71	MARKNV	0774	72	MINDEX	1061	198	BASETEMP
0163	1447	USERPRIO	0301	69	UPOLDMOD	0371	71	NVSAVE	0775	72	MMNUMBER	1062	73	PHSPRDT4
0164	58	UPLOCKFL	0302	69	BESTI	0372	71	CADRFLSH	0776	72	DSPCNT	1063	73	TBASE5
0164	69	LOC	0302	69	UPVERB	0373	71	CADRMARK	0777	72	DSPCOUNT	1064	73	PHSPRDT5
0164	1447	COPINDEX	0303	69	BESTJ	0374	71	TEMPFLSH	1000	72	DECBRNCH	1065	73	TBASE6
0165	58	VERIFLAG	0303	69	UPCOUNT	0375	71	FAILREG	1001	72	VERBREG	1066	73	PHSPRDT6
0165	69	BANKSET	0304	69	CNTMTIME	0400	71	VAC1USE	1002	72	NOUNREG	1067	74	EBANKSAV
0165	1447	MPAC2SAV	0304	69	STARIND	0401	71	VAC1	1003	72	XREG	1067	1447	DSPFLG
0166	58	ATTCHFLG	0304	69	UPBUFF	0454	71	VAC2USE	1004	72	YREG	1070	74	MARKEBAN
0166	69	PUSHLOC	0305	69	SW/NDX	0455	71	VAC2	1005	72	ZREG	1070	1447	MARKFLAG
0167	58	IFFSW	0306	70	XSCREF	0530	71	VAC3USE	1006	72	XREGLP	1071	74	EBANKTEM
0167	69	PRIORITY	0306	70	XSMD	0531	71	VAC3	1007	72	HITEMOUT	1071	1447	SAVEFLAG
0170	58	RPCFLAG	0314	70	YSCREF	0604	71	VAC4USE	1007	72	YREGLP	1072	74	MARK2PAC
0172	58	NEWIFLG	0314	70	YSMD	0605	71	VAC4	1010	72	LOTEMOUT	1073	74	RISAVE
0173	32	MOONTHIS	0322	70	ZSCREF	0660	71	VAC5USE	1010	72	ZREGLP	1074	74	OLDBT1
0173	58	CMCONFLG	0322	70	ZSMD	0661	71	VAC5	1011	73	MODREG	1074	74	1/PIPADT
0174	32	MOONTH	0324	69	ENDBUF	0705	1383	GOLOC	1012	73	DSPLOCK	1075	74	HALFY
0174	59	LMCONFLG	0325	69	V1	0734	71	KEYTEMP2	1013	73	REQRET	1075	74	TEMK
0175	59	ADVTRK	0327	69	A0	0734	71	RUPTAGN	1014	73	LOADSTAT	1076	74	ROOTRET
0176	59	P39/79SW	0330	69	INTWAKIC	0735	71	STARCODE	1015	73	CLPASS	1076	74	SQ
0177	59	SURFFLAG	0330	69	UPTEMP	0736	71	SINCDU	1016	73	NOUT	1077	74	SQRARG
0200	59	INFINFLG	0330	1296	INTWAKUC	0736	71	SINCDUY	1017	73	NOUNCADR	1100	75	TDEC
0201	59	CRDERSW	0331	69	UPVERBSV	0736	71	STARALGN	1020	73	MONSAVE	1102	75	COLREG
0202	59	APSESW	0332	70	DNLSTADR	0740	71	SINCDU2	1021	73	MONSAVE1	1103	75	LANDLAT
0203	59	COGAFLAG	0332	70	DNLSTCOD	0742	71	SINCDUX	1022	73	MONSAVE2	1103	75	LAT
0206	60	360SW	0333	70	DUMPCNT	0744	71	COSCDU	1023	73	DSPTAB	1105	75	LONG
0207	60	SWTOVER	0334	70	LOATALST	0744	71	COSCDUY	1037	73	NVQTEM	1107	75	ALT
0210	60	V67FLAG	0334	1066	CTLIST	0746	71	COSCDU2	1040	73	NVBNKTEM	1111	75	VV

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DEF	PAGE	SYMBOL	DEF	PAGE	SYMBOL	DEF	PAGE	SYMBOL	DEF	PAGE	SYMBOL	DEF	PAGE	SYMBOL
1117	75	ZV	1222	76	AVGEXIT	1320	78	IMODES30	E3,1437	81	PHSBB1	E3,1554	83	RRECTCSM
1125	75	VHFCNT	1222	77	RCL	1321	78	IMODES33	E3,1440	81	PHSNAME2	E3,1554	83	RRECTHIS
1126	75	MARKCTR	1224	76	TEMX	1322	78	IMUCADR	E3,1441	81	PHSBB2	E3,1562	83	VRECTCSM
1126	75	TRKMKCNT	1224	77	MARKTIME	1322	78	MODECADR	E3,1442	81	PHSNAME3	E3,1570	83	TETCSM
1127	75	IRETURN1	1225	76	TEMY	1323	78	OPTCADR	E3,1443	81	PHSBB3	E3,1570	83	TETTHIS
1127	75	P30/RET	1226	76	TEMZ	1324	78	RADCADR	E3,1444	81	PHSNAME4	E3,1572	83	DELTACSM
1130	75	RATEINDX	1226	77	VTEMP	1325	78	ATTCADR	E3,1445	81	PHSBB4	E3,1600	83	NUVCSM
1131	75	OPTION1	1227	76	PIPCTR	1327	78	ATTPRIO	E3,1446	81	PHSNAME5	E3,1606	83	RCVCSM
1132	75	OPTION2	1230	76	PIPAGE	1330	78	MARKSTAT	E3,1447	81	PHSBB5	E3,1614	83	VCVCSM
1133	75	LONGCADR	1231	76	RN1	1331	78	OPTMODES	E3,1450	81	PHSNAME6	E3,1622	83	TCCSM
1135	75	LONGBASE	1234	77	UM	1332	78	HOLDFLAG	E3,1451	81	PHSBB6	E3,1624	83	XKEPCSM
1137	75	LONGTIME	1237	76	VN1	1333	78	CPHIX	E3,1452	81	PBIASX	E3,1626	83	RRECTLEM
1141	75	DELAYLOC	1242	77	MARKDATA	1336	78	TEVENT	E3,1452	81	PIPABIAS	E3,1626	83	RRECTOTH
1145	75	NVWORD1	1244	77	USTAR	1336	78	TLIFTOFF	E3,1453	81	PIPASCF	E3,1634	83	VRECTLEM
1146	75	TEMPR60	1245	76	PIPTIME1	1340	79	NORMEX	E3,1453	81	PIPASCFX	E3,1642	83	T-OTHER
1147	75	PRIOTIME	1247	76	GDT1/2	1341	79	CDUCHKWD	E3,1454	81	PBIASY	E3,1642	83	TETLEM
1150	75	TIME2SAV	1252	77	WIXA	1342	79	TRUNBIAS	E3,1455	81	PIPASCFY	E3,1642	83	TETOTHER
1150	76	POINTEX	1253	77	WIXB	1343	79	XMODULO	E3,1456	81	PBIASZ	E3,1644	83	DELTALEM
1151	76	VHFTIME	1254	77	ZIXA	1345	79	YMODULO	E3,1457	81	PIPASCFZ	E3,1652	83	NUVLEM
1152	75	SCALSAVE	1255	76	GOBL1/2	1347	79	EPSILONT	E3,1460	81	GBIASX	E3,1660	83	RCVLEM
1154	75	REDOCTR	1255	77	ZIXB	1351	80	RTED1	E3,1460	81	NBDX	E3,1666	83	VCVLEM
1155	75	CPHI	1256	77	DELTAX	1353	80	OVTHRESH	E3,1461	81	NBDY	E3,1674	83	TCLEM
1155	76	THETAD	1256	77	TRIPA	1354	80	HORIZALT	E3,1462	82	NBDZ	E3,1676	83	XKEPLEM
1156	76	RDOTREF	1256	77	VHFRANGE	1356	80	ALTVAR	E3,1463	82	ADIAX	E3,1700	83	X789
1156	75	OTHETA	1256	603	S22UUT	1357	79	SELFERAS	E3,1464	82	ADIAY	E3,1706	83	TEPHEM
1157	75	OPSI	1261	77	TEMPVAR	1357	79	SFAIL	E3,1465	82	ADIAZ	E3,1706	84	TIMSUBO
1157	76	VREF	1263	77	ENTRYVN	1360	79	ERESTORE	E3,1466	82	ADSRAX	E3,1711	83	AZO
1160	76	DESOPTT	1263	77	PADLONG	1361	79	SELFRET	E3,1467	82	ADSRAY	E3,1713	83	-AYO
1160	55	TRUNA	1265	77	LIFTTEMP	1362	79	SMODE	E3,1470	82	ADSRAZ	E3,1713	83	UNITW
1161	76	DESOPTS	1267	77	TEPHEM1	1363	79	ALMCADR	E3,1471	82	COMMAND	E3,1715	83	AXO
1161	55	SHAFTA	1272	77	PONESALT	1365	79	ERCOUNT	E3,1471	82	OCOMP	E3,1721	83	R-OTHER
1162	76	DELV	1272	77	UCL	1366	79	SCOUNT	E3,1474	82	CDUIND	E3,1727	83	V-OTHER
1162	76	DELVX	1300	77	TEMPOR1	1371	79	SKEEP1	E3,1477	82	OCOMPSW	E3,1735	83	REFSMMAT
1164	76	DELVY	1302	77	DSRUPTSW	1372	79	SKEEP2	E3,1500	82	DIFEQCNT	E3,1757	84	UNITR
1166	76	DELVZ	1303	77	OPTIND	1373	79	SKEEP3	E3,1501	82	UPSVFLAG	E3,1765	84	RMAG
1170	76	RN	1304	77	LGYRO	1374	79	SKEEP4	E3,1502	82	RRECT	E3,1767	84	END-E3
1176	76	VN	1305	77	COMMANDO	1375	79	SKEEP5	E3,1510	82	VRECT	E4,1400	85	WRENDPOS
1204	76	PIPTIME	1307	78	ZONE	1376	79	SKEEP6	E3,1516	82	TET	E4,1400	89	TRANSM1
1206	76	GDT/2	1310	78	T6LOC	1377	79	SKEEP7	E3,1520	82	TDELTAV	E4,1401	85	WRENDVEL
1206	77	CSMPOS	1311	78	T6ADR	1377	80	END-UE	E3,1526	82	TNUV	E4,1402	85	RMAX
1214	76	GOBL/2	1312	78	T5LOC	E3,1400	81	LST1	E3,1534	82	RCV	E4,1403	85	VMAX
1214	77	LEMPOS	1314	78	SWSAMPLE	E3,1410	81	LST2	E3,1542	82	VCV	E4,1404	85	WORBPOS
1214	603	S22UOFF	1315	78	DESOPMOD	E3,1432	81	RSBBQ	E3,1550	82	TC	E4,1405	85	WORBVEL
1214	603	9DWXX	1316	78	WTOPTION	E3,1434	81	LONGEXIT	E3,1552	82	XKEP	E4,1406	85	S22WSUBL
1222	76	AVEGEXIT	1317	78	ZOPTCNT	E3,1436	81	PHSNAME1	E3,1552	93	XPREV	E4,1407	85	RPVAR

ERASABLE & EQUALS CROSS-REFERENCE TABLE SHOWING DEFINITION, PAGE OF DEFINITION, AND SYMBOL

DEF	PAGE	SYMBOL	DEF	PAGE	SYMBOL	DEF	PAGE	SYMBOL	DEF	PAGE	SYMBOL	DEF	PAGE	SYMBOL
E4,1411	85	504LM	E4,1717	87	EGRESS	E4,1766	88	QSAVED	E5,1454	95	LOS1	E5,1562	90	YNB1
E4,1417	85	EMSALT	E4,1720	87	RANGE	E4,1767	89	RTRN	E5,1454	96	ALXIS	E5,1570	90	EMATRIX
E4,1421	85	ATTGINC	E4,1720	87	RHOSE	E4,1770	89	RGEXIT	E5,1455	96	CMPXI	E5,1570	90	ZNB1
E4,1422	85	ALFDK	E4,1720	87	XR1HOLD	E4,1770	89	SUBEXIT	E5,1456	96	ALK	E5,1570	96	WPLATI
E4,1423	85	PTIGINC	E4,1720	88	HPERMIN	E4,1771	89	VONE'	E5,1460	96	THETAX	E5,1576	90	SAVQR52
E4,1425	85	RLS	E4,1720	622	WWPOS	E4,1777	89	END-E4	E5,1460	97	THETAX1	E5,1577	96	RESTARPT
E4,1433	85	TIMEMO	E4,1721	125	RETLOCN	E4,1777	89	INTVAR	E5,1462	95	LOS2	E5,1600	90	PLANVEC
E4,1436	85	VECOEM	E4,1722	87	GAMMASB	E5,1400	90	W	E5,1466	96	THETAN	E5,1606	90	TSIGHT
E4,1532	85	RESO	E4,1722	87	RRATE	E5,1400	95	AZIMUTH	E5,1466	97	THETAN1	E5,1610	90	DELTAR
E4,1540	86	VESO	E4,1722	87	VECTIME	E5,1402	95	LATITUDE	E5,1470	95	CALCDIR	E5,1610	90	DVLOS
E4,1546	86	OMEGAES	E4,1722	88	RPADTEM	E5,1404	95	ERVECTOR	E5,1471	95	COUFLAG	E5,1610	90	STARSAV1
E4,1550	86	PBODY	E4,1722	622	WWVEL	E5,1412	95	LENGTHOT	E5,1472	95	GYTOBETO	E5,1610	90	TINTSOI
E4,1551	86	ALPHAV	E4,1724	87	JLOOPCNT	E5,1413	95	LOSVEC	E5,1472	96	VLAUNS	E5,1610	91	IT
E4,1557	86	BETAV	E4,1724	87	RTHETA	E5,1413	95	SXTOPTN	E5,1473	95	OPTNREG	E5,1612	90	DELTTIME
E4,1565	86	PHIV	E4,1724	88	TSTART82	E5,1421	95	NOXCTR	E5,1474	95	SAVE	E5,1614	90	TARGTIME
E4,1573	86	PSIV	E4,1724	622	WWOPT	E5,1422	95	PIPINDEX	E5,1474	96	FILDELV	E5,1616	90	STARSAV2
E4,1601	86	FV	E4,1725	87	KLOOPCNT	E5,1423	95	POSITON	E5,1474	96	WPLATO	E5,1616	90	UNRM
E4,1607	86	BETAM	E4,1726	87	NKVAL	E5,1424	95	QPLAC	E5,1474	97	FILDELV1	E5,1616	91	THETZERO
E4,1611	86	H	E4,1726	87	RONE	E5,1425	95	QPLACE	E5,1476	96	INTVEC	E5,1616	91	US
E4,1613	86	GMODE	E4,1726	88	RPASS36	E5,1426	95	QPLACES	E5,1476	97	INTVEC1	E5,1620	91	TFI
E4,1614	86	IRETURN	E4,1727	87	DELTAL	E5,1427	95	RUN	E5,1477	95	SFCONST1	E5,1622	91	DELVEE
E4,1615	86	NORMGAM	E4,1731	87	TK	E5,1430	95	STOREPL	E5,1500	96	INTY	E5,1624	90	ULOS
E4,1616	86	VECTAB	E4,1733	87	INDEXNUM	E5,1431	95	SOUTHDR	E5,1500	96	TIMER	E5,1624	91	HP
E4,1624	86	BASECTP	E4,1734	87	LONGSAVE	E5,1431	95	TARGI/2	E5,1502	96	ANGZ	E5,1626	91	TFO
E4,1624	86	VACX	E4,1734	87	VONE	E5,1432	95	TAZEL1	E5,1502	96	DATAPL	E5,1630	91	HPO
E4,1626	86	VACY	E4,1734	88	UNP36	E5,1440	95	TEMPTIME	E5,1504	96	INTZ	E5,1631	96	GEOSAVED
E4,1630	86	VACZ	E4,1736	87	PCSVECT	E5,1442	95	TMARK	E5,1506	96	ANGY	E5,1631	97	GEOSAVE1
E4,1640	86	BASECTV	E4,1742	88	URONE	E5,1444	95	CDUTIME1	E5,1510	96	ANGX	E5,1632	90	ACTCENT
E4,1640	86	ERADM	E4,1742	88	V82FLAGS	E5,1444	95	GENPL	E5,1512	96	DRIFTC	E5,1632	91	DELVEC
E4,1642	86	INCOPPEX	E4,1743	88	TFF	E5,1444	96	AINLA	E5,1514	96	DRIFTI	E5,1632	96	PREMTRXC
E4,1654	86	BASETHP	E4,1744	87	VELVECT	E5,1444	96	RDSP	E5,1520	96	VLAUN	E5,1632	97	PREMTRX1
E4,1662	86	BASETHV	E4,1745	88	-TPER	E5,1444	96	WANGD	E5,1522	96	ACCWD	E5,1633	96	LAUNCHAZ
E4,1662	86	RPCV	E4,1747	88	THETA(1)	E5,1446	95	CDUTIMEF	E5,1530	96	POSNV	E5,1633	97	LUNCHAZ1
E4,1670	86	KEPRTN	E4,1751	88	HAPOX	E5,1446	96	WANGI	E5,1532	96	DPIPAY	E5,1634	90	DELVTPI
E4,1670	86	CRIGEX	E4,1752	87	LSLONG	E5,1450	95	IMU/OPT	E5,1536	96	DPIPAZ	E5,1634	90	TDEC2
E4,1671	86	BASETIME	E4,1753	88	HPERX	E5,1450	95	TEMPADD	E5,1540	96	ALTIM	E5,1634	91	MAGVTPI
E4,1671	86	RCVV	E4,1755	88	ACPTIME	E5,1450	96	TORQNDX	E5,1541	96	ALTIMS	E5,1634	603	S22RL
E4,1673	86	CRIG	E4,1755	88	RSP-RREC	E5,1450	96	WANGT	E5,1542	96	ALDK	E5,1635	96	NEWAZMTH
E4,1674	86	STATEXIT	E4,1757	88	LANDLONG	E5,1451	95	CDUREADF	E5,1544	96	MASKREG	E5,1635	97	NEWAZ1
E4,1677	86	RPSV	E4,1761	88	LANDALT	E5,1451	95	TEMP	E5,1546	96	CDUNDX	E5,1636	90	DELVTPF
E4,1705	86	XKEPNEW	E4,1763	88	KT	E5,1452	95	CDUREAD1	E5,1547	96	RESULTCT	E5,1636	91	RELDELV
E4,1707	87	ALPHAM	E4,1763	89	HAPO	E5,1452	95	NOBITS	E5,1552	96	COUNTPL	E5,1637	96	OLDAZMTH
E4,1711	87	TAU.	E4,1763	89	NORMTPI	E5,1452	96	DRIFTT	E5,1553	96	CDUANG	E5,1637	97	OLDAZ1
E4,1713	87	DT/2	E4,1765	88	VERBNOUN	E5,1453	95	CDULIMIT	E5,1554	90	XNB1	E5,1640	90	POSTTPI
E4,1715	87	P21TIME	E4,1765	89	HPER	E5,1453	95	CHAN	E5,1560	96	DELM	E5,1640	91	T3TOT4

ERASABLE & EQUALS CROSS-REFERENCE TABLE SHOWING DEFINITION, PAGE OF DEFINITION, AND SYMBOL

DEF	PAGE	SYMBOL	DEF	PAGE	SYMBOL	DEF	PAGE	SYMBOL	DEF	PAGE	SYMBOL	DEF	PAGE	SYMBOL
E5,1641	97	TCLDAZMT	E5,1713	93	U2	E5,1775	92	PAC	E6,1457	99	BLAST	E6,1515	105	EDOT
E5,1641	97	TCLDAZ1	E5,1714	94	TDVEL	E5,1777	92	QMIN	E6,1461	99	BLAST1	E6,1515	105	YNDX
E5,1642	90	END-W	E5,1721	92	YDC	E5,1777	97	END-E5	E6,1463	99	BLAST2	E6,1515	109	COSOCOSM
E5,1642	93	DELX	E5,1721	92	YNB	E6,1400	98	WMIDPOS	E6,1465	99	T5PHASE	E6,1516	100	VARST5
E5,1642	94	OMEGAM1	E5,1721	93	MAGVEC2	E6,1401	98	WMIDVEL	E6,1466	99	DAPDATR1	E6,1516	105	ZNDX
E5,1643	97	GEOCCMPS	E5,1721	93	R2	E6,1402	98	RVAR	E6,1467	99	DAPDATR2	E6,1517	105	AERR
E5,1643	97	GEOCCMP1	E5,1722	94	ZI	E6,1404	98	RVARMIN	E6,1470	99	IXX	E6,1517	105	DELTEMPY
E5,1644	93	DELT	E5,1723	93	UR1	E6,1407	98	LADPAD	E6,1471	99	IAVG	E6,1517	105	RINDEX
E5,1644	97	1SECXT	E5,1727	92	ZDC	E6,1410	98	LODPAD	E6,1472	99	IAVG/TLX	E6,1520	105	EDOTVEL
E5,1644	97	1SECXT1	E5,1727	92	ZNB	E6,1411	98	ALFAPAD	E6,1473	99	LEMMASS	E6,1520	105	PINDEX
E5,1645	97	GTSWTLST	E5,1731	93	SNTH	E6,1412	98	ESTROKER	E6,1474	99	CSMMASS	E6,1521	105	DELTEMPZ
E5,1645	97	GTSWTLT1	E5,1733	93	CSTH	E6,1413	98	EKPRIME	E6,1475	99	MASS	E6,1521	105	YINDEX
E5,1646	93	URRECT	E5,1735	92	CULTRIX	E6,1415	98	ETDECAY	E6,1475	99	WEIGHT/G	E6,1522	100	LASTMASP
E5,1646	97	ERECTIME	E5,1735	92	STARAD	E6,1416	98	EKTLX/I	E6,1476	99	AK	E6,1522	105	AERRVEL
E5,1646	97	ERECTIM1	E5,1735	92	VEARTH	E6,1420	98	ETVCDT/2	E6,1476	110	PAXERR	E6,1522	105	NRJETS
E5,1647	97	ERCOMP	E5,1735	93	1-CSTH	E6,1421	98	ETSWITCH	E6,1477	99	AK1	E6,1523	100	TVCTMP1
E5,1647	97	ERCOMP1	E5,1737	93	CSTH-RHC	E6,1422	98	ECORFRAC	E6,1500	99	AK2	E6,1523	105	ADBVEL
E5,1650	94	OMEGAM2	E5,1741	93	P	E6,1423	98	EREPFRAC	E6,1501	99	RCSFLAGS	E6,1523	105	NPJETS
E5,1654	93	RCNORM	E5,1743	92	VSUN	E6,1425	98	PACTOFF	E6,1502	99	T5TEMP	E6,1524	105	NYJETS
E5,1655	97	GTSOPNDZ	E5,1743	93	R1A	E6,1426	98	YACTOFF	E6,1503	99	EDRIVEX	E6,1525	100	OMEGAC
E5,1655	97	ZERONDX	E5,1744	94	22SUBSCL	E6,1427	98	APO	E6,1503	112	OLDBODY1	E6,1525	100	OMEGAXC
E5,1655	97	ZERONDX1	E5,1745	93	VVEC	E6,1427	98	AYO	E6,1504	100	EDRIVEY	E6,1525	100	TVCRCS
E5,1656	93	RVEC	E5,1745	94	CXOFF	E6,1430	98	AP1	E6,1504	112	OLDBODY2	E6,1525	105	WBODY
E5,1656	93	R1VEC	E5,1746	94	8KK	E6,1430	98	AY1	E6,1505	100	EDRIVEZ	E6,1525	113	ASPS(TM)
E5,1656	94	OMEGAM3	E5,1747	94	8NN	E6,1432	98	AP2	E6,1505	112	OLDBODY3	E6,1527	100	OMEGAYC
E5,1656	97	PERFCLAY	E5,1750	94	S22LCC	E6,1432	98	AY2	E6,1506	100	INTTEMP	E6,1527	105	WBODY1
E5,1664	93	R2VEC	E5,1751	92	VMOON	E6,1434	98	AP3	E6,1506	100	PHI333	E6,1531	100	OMEGAZC
E5,1664	94	HOLDW	E5,1751	94	LANDMARK	E6,1434	98	AY3	E6,1506	105	SPNDX	E6,1531	105	WBODY2
E5,1671	92	XSM	E5,1752	94	HORIZON	E6,1436	98	BP1	E6,1506	109	CALFA	E6,1533	100	OMEGAB
E5,1672	93	TDESIRED	E5,1753	93	ECC	E6,1436	98	BY1	E6,1507	100	PSI333	E6,1533	100	OMEGAXB
E5,1673	92	-COSB	E5,1753	94	IDOFLMK	E6,1440	98	BP2	E6,1507	105	DPNDX	E6,1533	103	OGARATE
E5,1674	93	GEOMSGN	E5,1754	94	TRUNION	E6,1440	99	BY2	E6,1507	109	SALFA	E6,1533	105	ADOT
E5,1675	92	SINB	E5,1755	93	RTNPRM	E6,1442	98	BP3	E6,1510	100	TEMP333	E6,1533	113	XPIPBUF
E5,1675	93	UN	E5,1756	93	SGNRDOT	E6,1442	99	BY3	E6,1510	105	KMPAC	E6,1534	113	YPIPBUF
E5,1677	92	YSM	E5,1757	92	OGC	E6,1444	99	V97VCNTR	E6,1510	109	SINM	E6,1535	100	OMEGAYB
E5,1703	93	VTARGTAG	E5,1757	92	SAX	E6,1445	99	MRKRTMP	E6,1511	100	VARST0	E6,1535	105	ADOT1
E5,1704	93	VTARGET	E5,1757	93	RDESIRED	E6,1445	99	TEMPDAP	E6,1511	109	COSM	E6,1535	113	ZPIPBUF
E5,1705	92	ZSM	E5,1761	92	IGC	E6,1447	99	CNTR	E6,1512	105	KMPTEMP	E6,1536	113	XOLDBUF
E5,1706	94	TDPOS	E5,1761	93	DELDEP	E6,1450	99	OGAD	E6,1512	109	SINO	E6,1537	100	OMEGAZB
E5,1712	93	RTNAPSE	E5,1761	93	TERRLAMB	E6,1451	99	RWORD1	E6,1513	105	WTEMP	E6,1537	105	ADOT2
E5,1712	93	RTNLAMB	E5,1763	92	MGC	E6,1452	99	RWORD2	E6,1513	105	XNDX1	E6,1537	113	YOLDBUF
E5,1712	93	RTNTR	E5,1763	93	DEPREV	E6,1453	99	PWORD1	E6,1513	109	COSO	E6,1540	113	ZOLDBUF
E5,1712	93	RTNTT	E5,1763	93	TPREV	E6,1454	99	PWORD2	E6,1514	105	XNDX2	E6,1541	100	PNSUM
E5,1713	92	XDC	E5,1765	92	STAR	E6,1455	99	YWORD1	E6,1514	109	SINOCOSM	E6,1541	103	NP2
E5,1713	92	XNB	E5,1773	92	SAC	E6,1456	99	YWORD2	E6,1515	105	DELTEMPX	E6,1541	105	MERRORX

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DEF	PAGE	SYMBOL	DEF	PAGE	SYMBOL	DEF	PAGE	SYMBOL	DEF	PAGE	SYMBOL	DEF	PAGE	SYMBOL
E6,1543	100	POSLM	E6,1573	110	RAXERR	E6,1623	101	DELYBAR	E6,1656	102	PCDUZPST	E6,1674	108	BETA/PIP
E6,1543	103	NP3	E6,1574	101	C4	E6,1623	106	J/M	E6,1656	107	RMANNDX	E6,1674	111	BIASTEMP
E6,1543	105	MERRCRY	E6,1574	106	THETADZ	E6,1623	110	CM/SAVE	E6,1657	102	MCDUYDOT	E6,1674	111	KV2
E6,1545	100	B1	E6,1574	113	Q7	E6,1624	106	J/M1	E6,1657	107	PMANNDX	E6,1675	102	DELOGART
E6,1545	105	MERRCR2	E6,1575	101	C5	E6,1624	110	JETEM2	E6,1660	102	MCDUZDOT	E6,1675	108	-DELAOG
E6,1546	100	B2	E6,1575	106	DELCDUX	E6,1625	101	PDELOFF	E6,1660	107	YMANNDX	E6,1676	102	SGNRT
E6,1547	101	B3	E6,1576	101	C6	E6,1625	106	J/M2	E6,1661	102	TVCEXPHS	E6,1676	108	-DELAIG
E6,1547	105	CF1	E6,1577	101	Y1	E6,1626	106	RACFAIL	E6,1661	108	AOG	E6,1677	102	DELOGA
E6,1550	101	B4	E6,1577	106	DELCDUY	E6,1627	101	YDELOFF	E6,1661	111	BCDU	E6,1677	108	-DELAMG
E6,1550	105	CF11	E6,1601	101	Y2	E6,1627	106	RBDFAIL	E6,1661	111	POLYNUM	E6,1700	102	I
E6,1551	101	B5	E6,1601	106	DELCDUZ	E6,1630	106	ACORBD	E6,1662	102	MASSTMP	E6,1700	108	CMDAPMOD
E6,1551	105	CF12	E6,1603	101	Y3	E6,1631	101	PCMD	E6,1662	108	AIG	E6,1700	111	SATRLRT
E6,1552	101	B6	E6,1603	106	DCDU	E6,1631	106	XTRANS	E6,1663	102	VCNTRTMP	E6,1701	102	IOGARATE
E6,1552	105	DRHO	E6,1603	109	ALFACOM	E6,1632	101	YCMD	E6,1663	108	AMG	E6,1701	108	PREL
E6,1553	101	J1	E6,1604	109	BETACOM	E6,1632	106	CH31TEMP	E6,1664	102	STRKTIME	E6,1702	102	TKTLX/I
E6,1554	105	DRHO1	E6,1605	101	Y4	E6,1633	101	TACTOFF	E6,1664	108	ROLL/180	E6,1702	108	QREL
E6,1555	101	J2	E6,1605	103	NY0	E6,1633	106	CHANTEMP	E6,1664	111	KSPNDX	E6,1702	111	KV3
E6,1556	106	DRHO2	E6,1605	109	TCFF	E6,1634	106	T5TIME	E6,1665	102	CADDY	E6,1702	111	OGF
E6,1557	101	J3	E6,1606	109	TBITS	E6,1635	101	T5TVCDT	E6,1665	108	ALFA/180	E6,1702	112	RPSTART
E6,1560	106	ATTSEC	E6,1607	101	Y5	E6,1635	106	RHO	E6,1665	111	KDPNDX	E6,1703	102	PACTTMP
E6,1561	101	J4	E6,1607	103	NY1	E6,1636	101	MDT	E6,1666	102	N	E6,1703	108	RREL
E6,1561	103	NP0	E6,1607	109	TCN2	E6,1636	106	RHO1	E6,1666	108	BETA/180	E6,1703	112	POLYSTOP
E6,1561	106	TAL	E6,1610	109	T2BITS	E6,1637	106	RHO2	E6,1666	111	KV1	E6,1704	108	BETADOT
E6,1562	106	TAU1	E6,1611	101	ROLLFIRE	E6,1640	106	AMGB1	E6,1666	111	MFISYM	E6,1704	112	BODY3
E6,1563	101	J5	E6,1611	106	DTHETASM	E6,1641	106	AMGB4	E6,1666	111	NCDU	E6,1705	102	YACTTMP
E6,1563	103	NP1	E6,1611	109	OUTTAG	E6,1642	107	AMGB5	E6,1666	111	P21	E6,1705	108	PHIDOT
E6,1563	106	TAU2	E6,1612	101	ROLLWORD	E6,1643	107	AMGB7	E6,1666	111	TMFI	E6,1705	112	BODY2
E6,1564	106	BIAS	E6,1612	109	NUJET	E6,1644	102	KPRIMEDT	E6,1666	111	TMIS	E6,1706	108	OLDELP
E6,1565	101	YNSUM	E6,1613	101	TEMREG	E6,1644	107	AMGB8	E6,1667	102	BUNKER	E6,1706	112	BODY1
E6,1565	103	NY2	E6,1613	109	-VT/180	E6,1645	107	CAPSI	E6,1667	108	AOG/PIP	E6,1707	102	CNTRTMP
E6,1565	106	BIAS1	E6,1614	101	STROKER	E6,1646	102	KTLX/I	E6,1670	102	REVS	E6,1707	108	OLDELQ
E6,1566	106	BIAS2	E6,1614	109	LCX/360	E6,1646	107	CDUXD	E6,1670	108	AIG/PIP	E6,1707	112	SPOLYARG
E6,1567	101	YDSUM	E6,1615	101	PERRB	E6,1647	102	TENMDOT	E6,1670	111	D21	E6,1710	102	STRKTTMP
E6,1567	103	NY3	E6,1615	109	XD/360	E6,1650	102	1/CONACC	E6,1671	102	CARD	E6,1710	108	OLDELR
E6,1567	106	ERRORX	E6,1616	109	VSQ/4API	E6,1650	107	CDUYD	E6,1671	108	AMG/PIP	E6,1710	110	VECQTEMP
E6,1567	110	VCT/180	E6,1617	101	YERRB	E6,1651	102	VARK	E6,1671	111	NEXTIME	E6,1710	111	BRATE
E6,1570	106	ERRORY	E6,1617	106	ATTKALMN	E6,1651	103	KPGEN3	E6,1672	102	OGANOW	E6,1710	111	COFSKEW
E6,1570	110	-VT/180E	E6,1617	109	JNDX	E6,1651	103	KYGEN3	E6,1672	108	ROLL/PIP	E6,1710	112	VDISP
E6,1571	101	C1	E6,1620	106	KMJ	E6,1652	102	REPFRAC	E6,1672	111	G21	E6,1711	102	NSUMTMP
E6,1571	106	ERRORZ	E6,1620	109	JNDX1	E6,1652	107	CDUZD	E6,1672	111	TTEMP	E6,1711	103	NP2TMP
E6,1572	101	C2	E6,1621	101	DELPBAR	E6,1653	102	VCNTR	E6,1673	102	OGAPAST	E6,1711	103	NY2TMP
E6,1572	106	THETADX	E6,1621	106	KMJ1	E6,1654	102	TVCPHASE	E6,1673	108	ALFA/PIP	E6,1711	108	JETAG
E6,1572	110	QAXERR	E6,1621	110	TCN1	E6,1654	107	SLOPE	E6,1673	111	POLYLCC	E6,1712	108	TUSED
E6,1573	101	C3	E6,1622	106	KMJ2	E6,1655	102	PCDUYPST	E6,1674	102	OGA	E6,1712	112	HDISP
E6,1573	106	THETADY	E6,1622	110	T1BITS	E6,1655	107	ADB	E6,1674	102	OGAERR	E6,1713	102	DSUMTMP

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DEF	PAGE	SYMBOL	DEF	PAGE	SYMBOL	DEF	PAGE	SYMBOL	DEF	PAGE	SYMBOL	DEF	PAGE	SYMBOL
E6,1713	103	NP3TMP	E6,1740	103	J6TMP	E7,1427	114	TGO	E7,1537	119	DELVQV	E7,1633	124	RTEGAM2D
E6,1713	103	NY3TMP	E6,1740	104	Y6TMP	E7,1431	114	DVCNTR	E7,1537	119	RACT3	E7,1634	118	VZC
E6,1713	108	PAXERR1	E6,1742	103	BZERO	E7,1432	114	DELVREF	E7,1541	115	URH	E7,1635	115	L/D1
E6,1714	108	ROLLTM	E6,1742	103	CZERO	E7,1447	114	NOMTIG	E7,1541	115	UXA/2	E7,1635	124	RCON
E6,1714	112	HOOTDISP	E6,1742	103	EP	E7,1447	118	END-KALC	E7,1545	119	VACT3	E7,1637	115	D
E6,1715	102	DELBRTMP	E6,1742	103	ERRBTMP	E7,1447	118	TX789	E7,1547	115	UYA/2	E7,1637	120	VPASS4
E6,1715	108	ROLLC	E6,1742	103	EY	E7,1447	119	DELTEEC	E7,1553	119	RPASS3	E7,1637	120	VTIG
E6,1716	111	CAM	E6,1742	111	COF	E7,1451	114	END-SVCR	E7,1555	115	UZA/2	E7,1637	124	R(T1)/
E6,1716	111	TM	E6,1744	103	CMDTMP	E7,1451	114	XSCD	E7,1561	119	VPASS3	E7,1641	115	DLEWD
E6,1716	112	BOOSTEMP	E6,1744	103	JZERO	E7,1451	115	RTINIT	E7,1563	115	UBX/2	E7,1642	118	UCLSTAR
E6,1717	103	B1TMP	E6,1744	103	NPD	E7,1451	119	DELEL	E7,1567	119	RINIT	E7,1643	115	K2ROLL
E6,1717	104	C1TMP	E6,1744	103	NYD	E7,1453	119	SECMAX	E7,1567	120	VAPREC	E7,1645	115	GOTOADDR
E6,1717	109	ROLLHOLD	E6,1744	103	YZERO	E7,1455	118	GAMMA	E7,1571	115	UBY/2	E7,1645	120	DELVEET3
E6,1720	103	B2TMP	E6,1746	104	NBRCYCLS	E7,1455	119	XXXALT	E7,1575	119	VINIT	E7,1645	120	DELVSIN
E6,1720	104	C2TMP	E6,1747	104	NBRCYCLP	E7,1457	114	YSCD	E7,1575	120	RAPREC	E7,1645	120	E2
E6,1720	109	JETEM	E6,1750	104	DELVSUM	E7,1457	115	RTEAST	E7,1577	115	UBZ/2	E7,1645	120	VGTEMP
E6,1720	111	MIS	E6,1750	111	SCAXIS	E7,1457	118	OMEGA	E7,1603	118	DATATEST	E7,1645	124	NNI
E6,1721	103	B3TMP	E6,1756	104	DELVSUMP	E7,1457	119	VG	E7,1603	118	TRUNX	E7,1645	124	R(T1)
E6,1721	104	C3TMP	E6,1756	111	POINTVSM	E7,1457	121	DV47TEMP	E7,1603	119	RTARG1	E7,1646	115	TEM1B
E6,1722	103	B4TMP	E6,1764	111	AM	E7,1465	114	ZSCD	E7,1604	118	UBARO	E7,1647	124	DT21PR
E6,1722	104	C4TMP	E6,1766	111	RAD	E7,1465	115	RTNORM	E7,1605	115	DTEARCT	E7,1650	115	MM
E6,1722	109	GAMA	E6,1770	112	GENRET	E7,1465	119	VRPREV	E7,1607	115	DIFF	E7,1650	118	USSTAR
E6,1723	103	B5TMP	E6,1770	113	TEMPROLL	E7,1473	114	VEL/C	E7,1611	115	DIFFOLD	E7,1651	115	GRAD
E6,1723	104	C5TMP	E6,1771	112	SAVBNK	E7,1473	115	RT	E7,1611	119	VIPRIME	E7,1651	124	MAMAX1
E6,1723	109	GAMDCT	E6,1771	113	TEMPALFA	E7,1473	119	TNIT	E7,1611	120	VPPREC	E7,1652	115	FX
E6,1724	103	B6TMP	E6,1772	112	SAVEDCDU	E7,1475	119	TNITPREV	E7,1612	118	UBAR1	E7,1653	115	LEQ
E6,1724	104	C6TMP	E6,1772	113	TEMPBETA	E7,1477	119	AXISCODE	E7,1613	115	FACTOR	E7,1653	120	DELVSAB
E6,1724	109	POSEXIT	E6,1773	113	GOGENRET	E7,1501	114	R53EXIT	E7,1615	115	FACT1	E7,1653	120	VGDISP
E6,1725	103	B7TMP	E6,1774	113	S61DT	E7,1501	115	UNI	E7,1617	115	FACT2	E7,1653	124	MAMAX2
E6,1725	104	C7TMP	E6,1775	112	R61CNTR	E7,1501	118	BVECTOR	E7,1617	119	VTPRIME	E7,1655	115	DHOOK
E6,1725	109	CM/GYMCT	E6,1776	113	END-E6	E7,1501	118	N49DISP	E7,1617	120	RPPREC	E7,1655	120	TINT
E6,1726	103	J1TMP	E7,1400	114	LAT(SPL)	E7,1501	603	S22UMBL	E7,1620	118	UBAR2	E7,1655	120	TPASS4
E6,1726	104	Y1TMP	E7,1402	114	LNG(SPL)	E7,1502	114	MARK2DWN	E7,1621	115	VSQUARE	E7,1655	124	R(T2)/
E6,1726	109	HEADSUP	E7,1404	114	DELVLVC	E7,1502	120	INTIME	E7,1623	115	LAD	E7,1656	118	RCLL
E6,1727	109	P63FLAG	E7,1404	114	DELVSLV	E7,1504	120	ITCTR	E7,1625	115	LOD	E7,1657	115	AHOOKDV
E6,1730	103	J2TMP	E7,1412	114	TIG	E7,1507	115	UNITV	E7,1625	119	+MGA	E7,1657	120	QTEMP
E6,1730	104	Y2TMP	E7,1412	125	SPRTETIG	E7,1515	115	VEL	E7,1626	118	RZC	E7,1660	120	TTOGO
E6,1732	103	J3TMP	E7,1414	114	RTARG	E7,1523	115	TIME/RTC	E7,1627	115	L/DCMINR	E7,1661	116	DVL
E6,1732	104	Y3TMP	E7,1422	114	DELLT4	E7,1523	118	DELTAG	E7,1627	119	COZY4	E7,1662	120	TTPI
E6,1734	103	J4TMP	E7,1424	114	ECSTEER	E7,1525	115	-VREL	E7,1631	115	KLAT	E7,1663	116	A1
E6,1734	104	Y4TMP	E7,1425	114	DVTOTAL	E7,1525	118	VARIANCE	E7,1631	120	END-IN/M	E7,1663	124	RD
E6,1736	103	J5TMP	E7,1425	114	END-DELV	E7,1530	118	RCLP	E7,1631	120	RPASS4	E7,1664	118	RL
E6,1736	103	NP1TMP	E7,1425	118	DEL	E7,1533	115	OLDUYA	E7,1631	120	RTIG	E7,1664	121	DELVCTL
E6,1736	103	NY1TMP	E7,1425	118	MFI	E7,1536	118	GRP2SVC	E7,1631	124	RTEOVD	E7,1664	121	END-P30S
E6,1736	104	Y5TMP	E7,1425	118	MFS	E7,1537	118	SVMRKDAT	E7,1633	115	L/D	E7,1664	121	VGBODY

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DEF	PAGE	SYMBOL	DEF	PAGE	SYMBOL	DEF	PAGE	SYMBOL	DEF	PAGE	SYMBOL	DEF	PAGE	SYMBOL
E7,1664	122	P30/31RT	E7,1720	121	VGPREV	E7,1753	123	DELHITE	4371	1171	PRIO30	4676	43	MIDFLBIT
E7,1664	122	TITER	E7,1720	121	VGTIG	E7,1753	124	BETA1	4372	371	B12-1	4676	45	ERADFBIT
E7,1664	122	TSTRT	E7,1721	116	GMAX	E7,1755	124	P(T1)	4373	1360	S8BITS	4676	47	22DSPBIT
E7,1665	116	VBARS	E7,1721	124	X(T1)	E7,1756	124	CFPA	4374	422	DEC57	4676	49	REFSMBIT
E7,1665	124	CRCON	E7,1722	116	VMAGI	E7,1760	124	PHI2	4374	438	19DECML	4676	50	NRMIDBIT
E7,1666	122	S22WLNL	E7,1722	123	PRAXIS	E7,1762	124	SPRTEX	4374	899	NINETEEN	4676	54	ENDSPBIT
E7,1667	116	COSG/2	E7,1723	124	T12	E7,1763	124	VNSTORE	4374	1171	OCT23	4676	54	STRULBIT
E7,1667	122	S22TOFF	E7,1723	125	X(T2)PRE	E7,1764	124	BETA12	4375	422	DEC17	4676	57	IGNFLBIT
E7,1667	124	RPRE,	E7,1724	115	LEWD	E7,1766	116	VL	4375	438	17DECML	4676	58	NEWIBIT
E7,1671	116	VS1	E7,1724	116	VIO	E7,1766	117	VPRED	4376	1171	OCT25	4676	60	V82EMBIT
E7,1671	122	S22TPRIM	E7,1725	123	MRKBUF1	E7,1770	116	GAMMAL	4376	1466	UP21	4676	184	OCT10000
E7,1671	124	V(T1)/	E7,1725	124	DELTAT	E7,1770	116	PREDANG	4377	642	OCT12	4676	938	ERRLIM
E7,1672	118	SRRETURN	E7,1725	125	X(T2)	E7,1770	117	GAMMAEI	4377	957	-ROLL1	4676	1171	PRIO10
E7,1672	121	P40TMP	E7,1726	116	L/DCALC	E7,1771	116	JJ	4377	1037	CM/SWIC2	4676	1171	QUARTER
E7,1673	116	V	E7,1726	116	TTE	E7,1774	123	COGA	4377	1171	TEN	4676	1359	SBIT13
E7,1673	122	S22ECRM	E7,1726	121	F	E7,1774	123	INDEP	4526	375	ENDPINBF	4677	43	MOONBIT
E7,1674	121	DELV1ML	E7,1727	124	NN1A	E7,1776	123	EPSILON1	4673	1167	LIMITS	4677	49	LUNABIT
E7,1674	122	MARKDOWN	E7,1730	116	ASKEP	E7,1777	125	END-E7	4674	43	CPHIBIT	4677	50	PDSPFBIT
E7,1675	116	LATANG	E7,1730	116	ASPS	E7,1777	125	WHOCARES	4674	44	NJETSBIT	4677	52	V59FLBIT
E7,1675	116	XRNGERR	E7,1730	121	QTEMP1	4000	25	FFTAG1	4674	46	DRFTBIT	4677	54	CMARMBIT
E7,1677	116	RDOT	E7,1731	116	ASP1	4000	25	FFTAG10	4674	50	MRKIDBIT	4677	57	ASTNBIT
E7,1677	124	V2(T1)/	E7,1731	124	NN2	4000	25	FFTAG12	4674	52	DSKYBIT	4677	58	CMOONBIT
E7,1701	116	THETAH	E7,1732	116	ASPUP	4000	25	FFTAG2	4674	54	DAP1BIT	4677	60	MAXDBBIT
E7,1702	121	CSTEER	E7,1732	116	TTE1	4000	25	FFTAG3	4674	56	TERMIBIT	4677	1171	PRIO4
E7,1703	116	ALP	E7,1733	116	ASPDWN	4000	25	FFTAG4	4674	58	RPQFLBIT	4677	1359	SBIT12
E7,1703	122	RM	E7,1733	124	RTENCKEX	4000	25	FFTAG7	4674	60	SWTOVBIT	4700	43	NORFBIT
E7,1703	122	S22RTNEX	E7,1734	116	ASP3	4000	25	FFTAG8	4674	1048	HALFPR	4700	45	ENG2BIT
E7,1704	121	BDT	E7,1734	117	ALTI	4000	25	FFTAG9	4674	1171	NEGMAX	4700	47	STEERBIT
E7,1704	122	Q611	E7,1734	123	MRKBUF2	4056	127	UPRPTBB	4674	1171	VLOADCOD	4700	49	P22MKBIT
E7,1705	116	C/DO	E7,1734	124	CONICX1	4105	1171	OCT60000	4674	1359	SBIT15	4700	51	MWAITBIT
E7,1705	122	Q6111	E7,1735	124	T2	4112	160	200MS	4675	43	JSWCHBIT	4700	52	INCORBIT
E7,1705	124	DV	E7,1736	117	HDOT	4160	1447	VERBMASK	4675	45	STIKBIT	4700	55	GMDIFBIT
E7,1706	122	SAVEPOS	E7,1737	124	UR1/	4215	362	PINSUPBT	4675	46	R21BIT	4700	57	TIMRBIT
E7,1707	116	DO	E7,1743	123	DELTEE	4270	753	OCT41	4675	48	GLOKFBIT	4700	59	LMOONBIT
E7,1707	124	V(T2)/	E7,1743	123	ELEV	4317	366	ENDBLFF	4675	50	PRIODBIT	4700	60	V94FLBIT
E7,1711	116	Q2	E7,1745	123	RTX1	4333	1145	FOURTEEN	4675	54	DAP2BIT	4700	1171	EBANK4
E7,1712	121	UT	E7,1745	123	XRS	4333	1145	OCT16	4675	57	ITSWBIT	4700	1171	PRIO2
E7,1713	116	RTGO	E7,1745	124	UV1/	4334	1167	OCT11	4675	60	V67FLBIT	4700	1171	2K
E7,1713	116	RTGON64	E7,1745	125	UH/	4334	1171	NINE	4675	62	INTFLBIT	4700	1359	SBIT11
E7,1713	117	RTGON67	E7,1746	123	RTX2	4362	226	OCT37	4675	795	NTRYPRIO	4701	43	ZMEASBIT
E7,1714	122	SAVEVEL	E7,1747	123	RTMU	4364	1082	FBANKMSK	4675	1059	KTRCS	4701	45	TARG1BIT
E7,1715	116	CNRNGERR	E7,1747	123	THETL	4364	1171	BANKMASK	4675	1171	HALF	4701	47	CYCLEBIT
E7,1715	124	T1	E7,1751	123	RTSR1/MU	4364	1360	-MAXADRS	4675	1171	POS1/2	4701	49	VFLAGBIT
E7,1717	116	KAT	E7,1751	123	TF	4371	184	OCT30000	4675	1171	PRIO20	4701	51	NWAITBIT
E7,1717	124	PCDN	E7,1753	123	CENTANG	4371	1171	BIT13-14	4675	1359	SBIT14	4701	53	PRFTRBIT

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DEF	PAGE	SYMBOL	DEF	PAGE	SYMBOL	DEF	PAGE	SYMBOL	DEF	PAGE	SYMBOL	DEF	PAGE	SYMBOL
4701	55	GMBCRBIT	4704	1359	SBIT7	4710	61	MID1FBIT	4716	1449	OCT7	5423	231	TERMEXTV
4701	55	GCNEBIT	4705	44	R53FLBIT	4710	938	1/ERRLIM	4717	160	OCT13	5423	1447	ENDEXT
4701	57	NORMSBIT	4705	46	IDLEBIT	4710	957	1/TMXFIR	4717	781	DVTHRUSH	5604	1460	ABORT
4701	59	ADVINBIT	4705	47	FINALBIT	4710	1171	FOUR	4717	1171	NOUTCON	5630	198	NEG7
4701	61	SAVECBIT	4705	49	ORBWFBIT	4710	1359	S+4	4720	694	ALRM15	5630	1360	S-7
4701	1171	PRIO1	4705	51	PINBRBIT	4710	1359	SBIT3	4720	721	PRFNSTAQ	5660	154	120MS
4701	1359	SBIT10	4705	53	3AXISBIT	4711	46	GUESSBIT	4720	1145	THIRTEEN	5660	1008	TWELVE
4702	43	NEEDLBIT	4705	56	HINDBIT	4711	48	CALC2BIT	4721	830	DEC15	5660	1406	BITS3&4
4702	45	R23BIT	4705	58	V37FLBIT	4711	50	D6OR9BIT	4722	160	OCTHIRTY	6000	25	FFTAG5
4702	45	TARG2BIT	4705	59	CRDERBIT	4711	54	MGLVFBIT	4726	263	MIXCON	6000	25	FFTAG6
4702	47	IMPULBIT	4705	61	N2217BIT	4711	56	CM/DSBIT	4726	1059	2T/TCDU	6043	1383	OCT177
4702	51	MRKNVBIT	4705	160	OCT40	4711	58	ATTCHBIT	4726	1360	CNTRCON	6056	1171	VLOAD*
4702	53	DMENFBIT	4705	1359	SBIT6	4711	62	MIDAVBIT	4726	1406	BITS4&6	6061	1017	=-4
4702	55	RELVBIT	4706	44	F2RTEBIT	4711	943	20MS	4727	938	KPDN	6061	1360	S-4
4702	57	RVSWBIT	4706	46	TRACKBIT	4711	1171	TWO	4727	938	KYDN	6211	724	SIGHTSIX
4702	59	P39SWBIT	4706	48	AVFLBIT	4711	1359	S+2	4730	524	BITS5-6	6211	1171	SIX
4702	61	VHFRBIT	4706	49	STATEBIT	4711	1359	SBIT2	4731	438	1/2SECX	6211	1360	S+6
4702	1359	SBIT9	4706	51	MRUPTBIT	4711	1464	UP72	4731	1410	OCT62	6214	32	DELAYNUM
4702	1384	SPSCODE	4706	53	GRRBKBIT	4712	44	KBIT	4732	957	+ROLL2	6214	1171	LOW2
4703	44	IMUSEBIT	4706	56	INRLBIT	4712	46	AVEGBIT	4732	1171	OCT120	6214	1171	THREE
4703	45	VEHUPBIT	4706	59	APSESBIT	4712	48	NODOBIT	4733	1171	OCT140	6214	1359	S+3
4703	49	PRECIBIT	4706	61	QUITBIT	4712	50	DIMOBIT	4734	422	1SECX	6214	1464	UP73
4703	51	NRMNVBIT	4706	1359	SBIT5	4712	52	XDSPBIT	4740	1059	2JETT	6440	1171	OCT30002
4703	53	COMPIBIT	4707	44	TRUNBIT	4712	54	RENDWBIT	4744	1171	EBANK3	6710	1097	Q+2
4703	55	EGFLGBIT	4707	46	TRMO3BIT	4712	56	GYMDIBIT	4744	1360	ERASCON6	6711	1368	TCQ
4703	55	KNCWNBIT	4707	48	PFRATBIT	4712	58	TFFSWBIT	4747	32	ERASIO	7632	1171	OCT10001
4703	55	R57BIT	4707	49	INTYBIT	4712	60	360SWBIT	4747	1360	S10BITS	7665	957	T6SCALE
4703	57	GONBYBIT	4707	52	NRUPTBIT	4712	62	AVEMDBIT	4752	795	EBACG	7671	971	PRIO34A
4703	59	SURFFBIT	4707	53	R60FLBIT	4712	1171	ONE	4752	1171	EBANK6	7671	1171	B12T14
4703	61	SOURCBIT	4707	56	LATSWBIT	4712	1359	S+1	4753	795	EBENTRY	7700	132	20MRUPT
4703	1359	SBIT8	4707	58	UPLOCBIT	4712	1359	SBIT1	4755	164	11,12	7707	552	FIRST3
4703	1406	IMUSEFLG	4707	60	COGAFBIT	4712	1464	UP71	4755	1360	SBNK03	7707	586	FURST3
4704	44	RNDV2BIT	4707	61	R31FLBIT	4713	1360	S-ZERO	4761	1375	OCT14000	7707	1447	PINMASK
4704	45	UPDATBIT	4707	197	OCT00010	4714	202	DNLADPCO	4762	154	OCT15000	7710	1066	MINB12
4704	47	FIRSTBIT	4707	1171	EIGHT	4714	721	P51ZERO	4763	154	33ROMSK	7711	128	74K
4704	47	XDELVBIT	4707	1359	SBIT4	4714	1359	S+ZERO	4763	188	IM33INIT	7714	1360	S-3
4704	49	CULTBIT	4710	44	FREEFBIT	4714	1464	UP70	4767	967	SPCOS1	7715	1017	=-2
4704	51	PRONVBIT	4710	46	SLOPEBIT	4715	188	NUMGRPS	4767	967	SPCOS2	7715	1360	S-2
4704	53	ENGONBIT	4710	48	CALC3BIT	4715	721	P51FIVE	4770	967	SPSIN1	7715	1383	MINUS2
4704	55	NOSWBIT	4710	50	VINTFBIT	4715	957	+ROLL1	4770	967	SPSIN2	7716	1171	MINUS1
4704	57	IDLEFBIT	4710	52	MKOVBIT	4715	1359	S+5	5112	439	GEOSTRT4	7716	1171	NEG1
4704	59	INFINBIT	4710	54	SCLNSBIT	4715	1466	UPDTPHAS	5112	1459	DOALARM	7716	1360	S-1
4704	61	R22CABIT	4710	56	.05GBIT	4716	354	DSPMSK	5222	154	GLOCKCK	00,2000	25	DLAYJOB
4704	63	REINTBIT	4710	56	NTARGBIT	4716	1171	LOW3	5415	1448	LINUS	01,2000	25	RESTART
4704	1168	SUPER100	4710	58	VERIFBIT	4716	1360	S+7	5423	231	ENDEXTVB	01,2000	205	PRDTTAB

ERASABLE & EQUALS CROSS-REFERENCE TABLE SHOWING DEFINITION, PAGE OF DEFINITION, AND SYMBOL

DEF	PAGE	SYMBOL	DEF	PAGE	SYMBOL	DEF	PAGE	SYMBOL	DEF	PAGE	SYMBOL	DEF	PAGE	SYMBOL
01,2001	205	CADRTAB	05,2056	173	CMENTRO2	10,2465	1447	GOXDSPF	20,2000	28	DAPS1	26,3323	31	HIUNITZ
01,2071	205	1.2SPOT	05,2056	174	CMPG2202	10,2501	1447	GOXDSPR	20,2000	28	DAPS2	26,3325	31	HIUNITY
01,2071	205	2.2SPOT	05,2063	168	CMCSTA03	10,2504	1447	GOXDSPFR	20,2000	28	DAPS6	26,3327	31	HIDPHALF
01,2071	206	3.2SPOT	05,2063	170	CMRENDO3	10,3176	1447	GOAGIN	21,2000	28	DAPS3	26,3327	31	HIUNITX
01,2543	1166	SW/	05,2063	173	CMENTRO3	10,3216	1447	GOPLAY	21,2000	28	MYSUBS	26,3327	32	THISAXIS
04,2000	25	CONICS1	05,2063	174	CMPG2203	11,2000	26	INTVEL	22,2000	28	APOPERI	26,3327	438	GEOCONS5
04,2000	25	E/PROG	05,2065	168	CMCSTA04	11,2000	26	ORBITAL	22,2000	28	DAPS8	26,3327	831	Q19
04,2000	25	INUCAL1	05,2065	171	CMRENDO4	11,2000	26	ORBITAL1	22,2000	28	KALCMCN1	26,3327	832	HALVE
04,2000	25	INTPRET2	05,2065	173	CMENTRO4	11,2000	26	S52/2	22,2000	28	KALCMCN2	26,3327	832	1/GMAX
04,2000	25	MIDDGIM	05,2065	175	CMPG2204	11,3700	1317	DQUARTER	22,2000	28	P40S5	26,3327	1172	DPHALF
04,2000	25	PINBALL4	05,2067	168	CMCSTA05	11,3700	1317	POS1/4	22,2000	28	RTBCODES	26,3331	31	HI6ZEROS
04,2000	25	R36LM	05,2067	171	CMRENDO5	11,3706	32	3/4LOWDP	22,2000	28	RTBCODE1	26,3331	830	3ZEROS
04,2000	25	STBLEORB	05,2076	168	CMCSTA06	11,3716	1317	2/3	22,2530	398	ENDDCM	26,3331	1227	ZEROO
04,2000	25	VERB37	05,2076	171	CMRENDO6	12,2000	26	CONICS	22,2736	403	LOCSKIRT	26,3331	1352	TFFZEROS
04,2010	357	MCDRCUTB	05,2076	175	CMPG2206	13,2000	27	INTINIT	22,3310	1352	RPAD1	27,2000	29	MANUVER
04,2403	199	FCADRMM1	05,2101	168	CMCSTA07	13,2000	27	LATLONG	23,2000	28	COMGEOM1	27,2000	29	MANUVER1
04,2440	200	PREMM1	05,2101	171	CMRENDO7	13,2000	27	ORBITAL2	23,2000	28	INFLIGHT	27,2000	29	P60S5
04,2475	201	EPREMM1	05,2101	173	CMENTRO7	13,2000	27	P76LOC	23,2000	28	POWFLITE	27,2000	29	R22S1
04,2476	201	CNLADMM1	05,2101	175	CMPG2207	13,2000	27	SR52/1	23,2000	28	POWFLIT1	27,2000	29	TOF-FF
04,3444	32	LOUNITZ	05,2113	165	NOMDNLST	13,2636	32	ATOPTHIS	23,2000	28	POWFLIT2	27,2000	29	TOF-FF1
04,3446	31	LOUNITY	05,2113	168	CMCSTADL	13,2651	32	NOVATHIS	23,2000	28	P11FOUR	27,2000	29	UPDATE1
04,3450	31	LODPHALF	05,2147	170	CMRENDDL	13,2711	32	ATOPOTH	23,2000	28	P20S2	27,2000	29	UPDATE2
04,3450	31	LOUNITX	05,2214	165	UPDNLIST	13,3022	32	THISPREC	23,2000	28	RENDGUID	27,2000	29	VECPT
04,3450	1173	HALFDP	05,2214	172	CMENTRDL	13,3036	32	OTHPREC	23,2000	28	R30LOC	27,3314	1351	TCDANZIG
04,3450	1206	DP1/2	05,2273	174	CMPG22DL	13,3730	1318	MUM	23,2461	762	300KFT	27,3327	830	C1/16
04,3450	1218	181	05,2632	184	GOPROG2	14,2000	27	P50S1	24,2000	28	LOADDAP	27,3333	830	BARELY1
04,3452	31	LOEZEROS	06,2000	26	INUCAL2	14,2000	27	RT53	24,2000	28	P40S	27,3335	1464	UPPART2
04,3452	1173	ZERODP	06,2000	26	INUCCMP	14,2000	27	STARTAB	25,2000	29	REENTRY	27,3454	1466	UPSTORE
04,3452	1207	2DZERO	06,2000	26	T4RUP	14,2216	701	LOCSAM	26,2000	29	EPHEM	27,3516	1467	UPPART3
04,3452	1255	KEPZERO	06,2665	153	ICDUFAIL	14,2707	711	R54	26,2000	29	INTPRET1	27,3645	1470	UPOUT
04,3452	1317	DPZERO	06,2665	153	IMUFAIL	14,3061	718	P53	26,2000	29	PLANTIN	27,3646	1466	UPOUT4
04,3463	1271	LDPCSMAX	07,2000	26	KEYRUPT	15,2000	27	ETRYDAP	26,2000	29	P05P06	30,2000	29	FCSTART
04,3476	31	LODP1/4	07,2000	26	MODESW	15,2000	27	P50S	26,2000	29	P60S	30,2000	29	IMUSUPER
04,3501	1255	BEE19	07,2000	26	RO2	15,2000	27	S52/3	26,2000	29	P60S1	30,2000	29	LOPC
04,3505	1255	BEE22	07,2000	26	SXTMARKE	15,2000	691	P54	26,2000	29	P60S2	30,2000	29	LOWSUPER
05,2000	26	DAPMASS	07,2000	26	XANG	15,3754	1059	1/16A1	26,2000	29	P60S3	30,2000	29	P20S1
05,2000	26	DOWNTELM	07,3012	1406	IMUFIN20	15,3761	1059	BUFLIM	26,2000	29	REENTRY1	30,2000	29	P20S6
05,2000	26	FRANGRES	07,3512	1405	OPTSTALL	16,2000	27	DAPROLL	26,2000	29	26P50S	30,2000	29	P40S3
05,2001	166	CMPOWEDL	10,2000	26	COMGEOM2	16,2000	27	P40S1	26,2641	753	SERVCAD2	30,2000	29	R35A
05,2047	168	CMCSTA01	10,2000	26	DISPLAYS	16,2000	27	P50S2	26,3144	832	LATSLOPE	31,2000	30	P30S1A
05,2047	170	CMRENDO1	10,2000	26	OPTDRV	16,3274	917	TVCADDR	26,3311	832	Q7MIN	31,2000	30	RT23
05,2047	172	CMENTRO1	10,2000	26	PHASETAB	17,2000	27	DAPS4	26,3321	31	HIDP1/4	31,2000	30	R34
05,2047	174	CMPG2201	10,2000	26	P60S4	17,2000	27	DAPS5	26,3321	831	VMIN	31,2000	30	R35
05,2056	168	CMCSTA02	10,2000	26	SXTMARK1	17,2000	27	DAPS7	26,3321	832	FOURTH	32,2000	30	DELRSPL1
05,2056	170	CMRENDO2	10,2461	1447	GOXDSP	17,3766	1030	ENDSLECT	26,3321	1352	TFF1/4	32,2000	30	IMUCAL3

ERASABLE & EQUALS CROSS-REFERENCE TABLE SHOWING DEFINITION, PAGE OF DEFINITION, AND SYMBOL

DEF	PAGE	SYMBOL	DEF	PAGE	SYMBOL	DEF	PAGE	SYMBOL	DEF	PAGE	SYMBOL	DEF	PAGE	SYMBOL
32,2000	30	MSGSCAN1	35,2000	30	CSI/COH	36,2000	30	RTE1	40,3406	360	ENDRELDS	42,2000	31	PINBALL3
32,2000	30	RTE	35,2000	30	P17S1	37,2000	31	BODYATT	40,3435	367	ENDBSUB1	42,2000	31	SBAND
33,2000	30	INLCAL	35,2000	30	P30S	37,2000	31	P11TWO	40,3435	1368	DSPMMJOB	42,3521	346	ENDHMSS
33,2000	30	TESTLEAD	35,2000	30	P30S1	37,2000	31	P20S	40,3571	380	ENDPINS1	43,2000	31	EXTVERBS
33,2447	422	3990DEC	35,2000	30	RTECCN1	37,2000	31	RENDEZ	41,2000	31	PINBALL2	43,2000	31	SELFCHEC
34,2000	30	P11ONE	35,2000	30	R31	37,2000	31	SERVICES	41,2612	327	ENDRTOUT	43,2002	376	PINTEST
34,2000	30	P20S3	35,3204	32	STATEST	40,2000	31	PINBALL1	41,3220	341	ENDRUTIN	43,2200	235	OPTCOARV
34,2000	30	P20S4	36,2000	30	MEASINC	40,2000	31	PINSUPER	41,3712	378	ENDPINS2	43,2710	253	V74
34,2000	30	RTECCN	36,2000	30	MEASINC1	40,2000	31	SELFSUPR	42,2000	31	EXTVBS	43,2751	256	GOSHOSUM
34,3463	607	R63CCMP	36,2000	30	P17S	40,3225	353	ENDECVN						

SUMMARY OF SYMBOL TABLE LISTINGS

4946 DEFINED NORMALLY

2175 DEFINED BY EQUALS

TOTAL: 7121

MEMORY TYPE & AVAILABILITY DISPLAY

0000	TO	0057	SPECIAL OR NONEXISTENT MEMORY	14,3754	TO 14,3777 AVAILABLE SWITCHABLE FIXED MEMORY
				15,2000	TO 15,3764 RESERVED SWITCHABLE FIXED MEMORY
		0060	AVAILABLE ERASABLE MEMORY	15,3765	TO 15,3777 AVAILABLE SWITCHABLE FIXED MEMORY
0061	TO	1377	RESERVED ERASABLE MEMORY	16,2000	TO 16,3736 RESERVED SWITCHABLE FIXED MEMORY
				16,3737	TO 16,3777 AVAILABLE SWITCHABLE FIXED MEMORY
E3,1400	TO	E3,1766	RESERVED SWITCHABLE ERASABLE MEMORY	17,2000	TO 17,3770 RESERVED SWITCHABLE FIXED MEMORY
E3,1767	TO	E3,1777	AVAILABLE SWITCHABLE ERASABLE MEMORY	17,3771	TO 17,3777 AVAILABLE SWITCHABLE FIXED MEMORY
E4,1400	TO	E4,1550	RESERVED SWITCHABLE ERASABLE MEMORY	20,2000	TO 20,3700 RESERVED SWITCHABLE FIXED MEMORY
E4,1551	TO	E4,1777	AVAILABLE SWITCHABLE ERASABLE MEMORY	20,3701	TO 20,3777 AVAILABLE SWITCHABLE FIXED MEMORY
E5,1400	TO	E5,1652	RESERVED SWITCHABLE ERASABLE MEMORY	21,2000	TO 21,3753 RESERVED SWITCHABLE FIXED MEMORY
E5,1653	TO	E5,1777	AVAILABLE SWITCHABLE ERASABLE MEMORY	21,3754	TO 21,3777 AVAILABLE SWITCHABLE FIXED MEMORY
E6,1400	TO	E6,1540	RESERVED SWITCHABLE ERASABLE MEMORY	22,2000	TO 22,3774 RESERVED SWITCHABLE FIXED MEMORY
E6,1541	TO	E6,1777	AVAILABLE SWITCHABLE ERASABLE MEMORY	22,3775	TO 22,3777 AVAILABLE SWITCHABLE FIXED MEMORY
E7,1400	TO	E7,1425	RESERVED SWITCHABLE ERASABLE MEMORY	23,2000	TO 23,3727 RESERVED SWITCHABLE FIXED MEMORY
E7,1426	TO	E7,1777	AVAILABLE SWITCHABLE ERASABLE MEMORY	23,3730	TO 23,3777 AVAILABLE SWITCHABLE FIXED MEMORY
				24,2000	TO 24,3707 RESERVED SWITCHABLE FIXED MEMORY
4000	TO	5664	RESERVED FIXED MEMORY	24,3710	TO 24,3777 AVAILABLE SWITCHABLE FIXED MEMORY
5665	TO	5777	AVAILABLE FIXED MEMORY	25,2000	TO 25,3770 RESERVED SWITCHABLE FIXED MEMORY
6000	TO	7754	RESERVED FIXED MEMORY	25,3771	TO 25,3777 AVAILABLE SWITCHABLE FIXED MEMORY
7755	TO	7777	AVAILABLE FIXED MEMORY	26,2000	TO 26,3776 RESERVED SWITCHABLE FIXED MEMORY
					26,3777 AVAILABLE SWITCHABLE FIXED MEMORY
00,2000	TO	00,3770	RESERVED SWITCHABLE FIXED MEMORY	27,2000	TO 27,3727 RESERVED SWITCHABLE FIXED MEMORY
00,3771	TO	00,3777	AVAILABLE SWITCHABLE FIXED MEMORY	27,3730	TO 27,3777 AVAILABLE SWITCHABLE FIXED MEMORY
01,2000	TO	01,3772	RESERVED SWITCHABLE FIXED MEMORY	30,2000	TO 31,3770 RESERVED SWITCHABLE FIXED MEMORY
01,3773	TO	01,3777	AVAILABLE SWITCHABLE FIXED MEMORY	31,3771	TO 31,3777 AVAILABLE SWITCHABLE FIXED MEMORY
				32,2000	TO 33,3775 RESERVED SWITCHABLE FIXED MEMORY
02,2000	TO	03,3777	SPECIAL OR NONEXISTENT MEMORY	33,3776	TO 33,3777 AVAILABLE SWITCHABLE FIXED MEMORY
				34,2000	TO 35,3775 RESERVED SWITCHABLE FIXED MEMORY
04,2000	TO	04,3647	RESERVED SWITCHABLE FIXED MEMORY	35,3776	TO 35,3777 AVAILABLE SWITCHABLE FIXED MEMORY
04,3650	TO	04,3777	AVAILABLE SWITCHABLE FIXED MEMORY	36,2000	TO 36,3766 RESERVED SWITCHABLE FIXED MEMORY
05,2000	TO	05,3610	RESERVED SWITCHABLE FIXED MEMORY	36,3767	TO 36,3777 AVAILABLE SWITCHABLE FIXED MEMORY
05,3611	TO	05,3777	AVAILABLE SWITCHABLE FIXED MEMORY	37,2000	TO 37,3702 RESERVED SWITCHABLE FIXED MEMORY
06,2000	TO	06,3653	RESERVED SWITCHABLE FIXED MEMORY	37,3703	TO 37,3777 AVAILABLE SWITCHABLE FIXED MEMORY
06,3654	TO	06,3777	AVAILABLE SWITCHABLE FIXED MEMORY	40,2000	TO 40,3736 RESERVED SWITCHABLE FIXED MEMORY
07,2000	TO	07,3721	RESERVED SWITCHABLE FIXED MEMORY	40,3737	TO 40,3777 AVAILABLE SWITCHABLE FIXED MEMORY
07,3722	TO	07,3777	AVAILABLE SWITCHABLE FIXED MEMORY	41,2000	TO 41,3714 RESERVED SWITCHABLE FIXED MEMORY
10,2000	TO	10,3704	RESERVED SWITCHABLE FIXED MEMORY	41,3715	TO 41,3777 AVAILABLE SWITCHABLE FIXED MEMORY
10,3705	TO	10,3777	AVAILABLE SWITCHABLE FIXED MEMORY	42,2000	TO 42,3707 RESERVED SWITCHABLE FIXED MEMORY
11,2000	TO	11,3723	RESERVED SWITCHABLE FIXED MEMORY	42,3710	TO 42,3777 AVAILABLE SWITCHABLE FIXED MEMORY
11,3724	TO	11,3777	AVAILABLE SWITCHABLE FIXED MEMORY	43,2000	TO 43,3763 RESERVED SWITCHABLE FIXED MEMORY
12,2000	TO	12,3737	RESERVED SWITCHABLE FIXED MEMORY	43,3764	TO 43,3777 AVAILABLE SWITCHABLE FIXED MEMORY
12,3740	TO	12,3777	AVAILABLE SWITCHABLE FIXED MEMORY		
13,2000	TO	13,3770	RESERVED SWITCHABLE FIXED MEMORY	44,2000	TO 57,3777 SPECIAL OR NONEXISTENT MEMORY
13,3771	TO	13,3777	AVAILABLE SWITCHABLE FIXED MEMORY		
14,2000	TO	14,3753	RESERVED SWITCHABLE FIXED MEMORY	60,2000	TO 67,3777 AVAILABLE SWITCHABLE FIXED MEMORY

MEMORY TYPE & AVAILABILITY DISPLAY

70,2000 TO 73,3777 SPECIAL OR NONEXISTENT MEMORY

ROUTINE:	COUNT	DATA FOR ROUTINE'S LAST REACH:	TOTAL:	CUMUL	
	REF	0 LAST TO 25:	0	0	0
BANKSUM	REF	1 LAST 25 TO 126:	75	75	75
00/DELAY	REF	1 LAST 1452 TO 1454:	30	30	105
00/INTER	REF	2 LAST 1119 TO 1159:	969	984	1089
01/EXEC	REF	1 LAST 1178 TO 1187:	272	272	1361
01/INTER	REF	1 LAST 1159 TO 1167:	157	157	1518
01/RSROU	REF	3 LAST 1382 TO 1384:	55	168	1686
01/RSTAB	REF	1 LAST 205 TO 214:	249	249	1935
01/WAIT	REF	2 LAST 1201 TO 1203:	31	170	2105
02/ALARM	REF	2 LAST 1459 TO 1463:	46	83	2188
02/BANK	REF	1 LAST 1070 TO 1074:	76	76	2264
02/COMST	REF	1 LAST 422 TO 425:	18	18	2282
02/DSPLA	REF	1 LAST 1429 TO 1429:	16	16	2298
02/EXEC	REF	2 LAST 1187 TO 1190:	6	65	2363
02/EXTVB	REF	1 LAST 1455 TO 1457:	19	19	2382
02/FCONS	REF	1 LAST 1167 TO 1169:	62	62	2444
02/FLAG	REF	1 LAST 1450 TO 1452:	32	32	2476
02/IMODE	REF	1 LAST 1384 TO 1385:	5	5	2481
02/INTER	REF	1 LAST 1174 TO 1175:	32	32	2513
02/PHASE	REF	4 LAST 1377 TO 1378:	4	104	2617
02/PIN	REF	6 LAST 374 TO 377:	37	246	2863
02/P00	REF	1 LAST 189 TO 189:	4	4	2867
02/P20	REF	1 LAST 620 TO 621:	0	0	2867
02/RSROU	REF	2 LAST 1381 TO 1382:	10	17	2884
02/RLPTS	REF	1 LAST 126 TO 128:	58	58	2942
02/TRAN	REF	1 LAST 1454 TO 1455:	15	15	2957
02/T4RPT	REF	1 LAST 128 TO 129:	12	12	2969
02/V37	REF	1 LAST 192 TO 192:	2	2	2971
02/WAIT	REF	2 LAST 1199 TO 1201:	24	75	3046
03/DAPEN	REF	1 LAST 1033 TO 1033:	6	6	3052
03/FCONS	REF	1 LAST 1169 TO 1172:	32	32	3084
03/FLAG	REF	1 LAST 1449 TO 1450:	27	27	3111
03/INTER	REF	2 LAST 1086 TO 1119:	732	937	4048
04/CONIC	REF	3 LAST 1271 TO 1279:	16	110	4158
04/EXTVB	REF	1 LAST 240 TO 240:	7	7	4165
04/MIDG	REF	1 LAST 483 TO 486:	61	61	4226
04/P00	REF	2 LAST 194 TO 195:	15	23	4249
04/P07	REF	2 LAST 413 TO 413:	5	32	4281
04/P3879	REF	1 LAST 515 TO 524:	225	225	4506
04/R02	REF	1 LAST 1407 TO 1410:	17	17	4523
04/R33	REF	1 LAST 239 TO 240:	26	26	4549
04/R36	REF	1 LAST 492 TO 494:	93	93	4642
04/V37	REF	2 LAST 195 TO 202:	234	328	4970
05/DLIST	REF	1 LAST 165 TO 178:	231	231	5201
05/DPROG	REF	1 LAST 1063 TO 1070:	173	173	5374
05/MASP	REF	1 LAST 910 TO 914:	91	91	5465
05/START	REF	1 LAST 178 TO 189:	407	407	5872
06/ICOMP	REF	1 LAST 290 TO 308:	247	247	6119
06/T4RPT	REF	2 LAST 129 TO 161:	680	690	6809
07/IMODE	REF	1 LAST 1385 TO 1407:	556	556	7365
07/KEYUP	REF	1 LAST 1413 TO 1429:	68	68	7433
07/PIA	REF	2 LAST 374 TO 374:	7	16	7449
07/SXTMK	REF	1 LAST 215 TO 227:	286	286	7735
07/XAXG	REF	1 LAST 546 TO 547:	46	46	7781
10/DSPLA	REF	2 LAST 1458 TO 1459:	9	659	8440
10/GECM	REF	1 LAST 282 TO 284:	35	35	8475
10/PHASE	REF	2 LAST 1375 TO 1377:	66	75	8550
10/SXT	REF	2 LAST 162 TO 163:	26	42	8592
10/SXTMK	REF	1 LAST 227 TO 229:	28	28	8620
10/S62.3	REF	1 LAST 769 TO 773:	34	34	8654
10/T4RPT	REF	2 LAST 163 TO 165:	49	89	8743
11/INITV	REF	1 LAST 477 TO 483:	174	174	8917
11/ORBIT	REF	1 LAST 1298 TO 1319:	821	821	9738
11/SR521	REF	1 LAST 726 TO 731:	156	156	9894
12/CONIC	REF	3 LAST 1259 TO 1271:	483	989	10883
13/INTIN	REF	3 LAST 1292 TO 1296:	144	631	11514
13/LT-LG	REF	1 LAST 1203 TO 1210:	159	159	11673
13/P76	REF	1 LAST 500 TO 504:	96	96	11769
13/S52.2	REF	1 LAST 725 TO 726:	26	26	11795
14/ICONS	REF	1 LAST 1173 TO 1174:	19	19	11814
14/INFLT	REF	1 LAST 715 TO 718:	39	39	11853
14/PICAP	REF	1 LAST 704 TO 708:	127	127	11980
14/P5153	REF	1 LAST 718 TO 723:	166	166	12146
14/R50	REF	2 LAST 713 TO 715:	74	118	12264
14/R51	REF	1 LAST 708 TO 711:	116	116	12380
14/R53	REF	1 LAST 723 TO 725:	51	51	12431
14/STARS	REF	1 LAST 1353 TO 1359:	223	223	12654
14/S50	REF	1 LAST 701 TO 704:	90	90	12744
15/DAPEN	REF	3 LAST 1038 TO 1063:	644	710	13454
15/P52	REF	1 LAST 691 TO 696:	161	161	13615

ROUTINE: COUNT DATA FOR ROUTINE'S LAST REACH:						TOTAL:	CUMUL
15/R52	REF	1	LAST	696	TO 701:	140	140 13755
15/R55	REF	1	LAST	711	TO 712:	27	27 13782
15/S52.3	REF	1	LAST	731	TO 732:	18	18 13800
16/ROLL	REF	1	LAST	949	TO 960:	274	274 14074
16/RSRT	REF	1	LAST	914	TO 920:	85	85 14159
16/R56	REF	1	LAST	732	TO 737:	130	130 14289
16/S40.1	REF	1	LAST	663	TO 665:	88	88 14377
16/S40.8	REF	1	LAST	672	TO 674:	87	87 14464
16/S40.9	REF	1	LAST	676	TO 679:	85	85 14549
16/TVCX	REF	1	LAST	901	TO 910:	197	197 14746
16/40.13	REF	1	LAST	679	TO 680:	65	65 14811
17/DAPJS	REF	1	LAST	1007	TO 1031:	629	629 15440
17/GEN3	REF	1	LAST	960	TO 967:	244	244 15684
17/S40.8	REF	1	LAST	674	TO 674:	10	10 15694
17/40.13	REF	1	LAST	680	TO 682:	16	16 15710
20/DAPEN	REF	1	LAST	1034	TO 1038:	86	86 15796
20/DAPS	REF	1	LAST	920	TO 942:	579	579 16375
20/STRK	REF	1	LAST	942	TO 949:	79	79 16454
20/S40.6	REF	1	LAST	682	TO 684:	69	69 16523
20/S40.8	REF	1	LAST	674	TO 676:	32	32 16555
20/S41.2	REF	1	LAST	684	TO 688:	149	149 16704
21/DAPAM	REF	1	LAST	993	TO 1005:	333	333 17037
21/DAPMS	REF	1	LAST	967	TO 970:	35	35 17072
21/DAPRC	REF	1	LAST	970	TO 993:	611	611 17683
21/RCSUP	REF	1	LAST	688	TO 691:	22	22 17705
22/DAPEX	REF	1	LAST	1005	TO 1007:	33	33 17738
22/KALC	REF	4	LAST	405	TO 411:	177	712 18450
22/PERAP	REF	1	LAST	486	TO 492:	78	78 18528
22/RTB	REF	1	LAST	1472	TO 1472:	181	181 18709
22/S41.1	REF	1	LAST	670	TO 672:	14	14 18723
23/GECM	REF	2	LAST	284	TO 290:	109	218 18941
23/ICONS	REF	1	LAST	1172	TO 1173:	16	16 18957
23/INFLT	REF	1	LAST	1319	TO 1329:	186	186 19143
23/PCWFL	REF	1	LAST	1329	TO 1340:	187	187 19330
23/R30	REF	1	LAST	504	TO 511:	221	221 19551
23/SR30S	REF	1	LAST	511	TO 515:	62	62 19613
23/STTKE	REF	1	LAST	536	TO 539:	65	65 19678
23/20SUB	REF	1	LAST	564	TO 567:	55	55 19733
24/P21	REF	1	LAST	448	TO 453:	66	66 19799
24/P40	REF	2	LAST	646	TO 663:	520	675 20474
24/P41	REF	1	LAST	641	TO 644:	109	109 20583
24/P47	REF	1	LAST	644	TO 646:	58	58 20641
24/R03	REF	1	LAST	246	TO 247:	50	50 20691
24/S40.1	REF	1	LAST	665	TO 667:	67	67 20758
24/S40.2	REF	1	LAST	667	TO 670:	117	117 20875
24/TVNG	REF	1	LAST	688	TO 688:	4	4 20879
25/ENTRY	REF	2	LAST	804	TO 830:	838	1014 21893
26/ENTRY	REF	2	LAST	830	TO 833:	109	150 22043
26/EPHEM	REF	1	LAST	737	TO 740:	71	71 22114
26/LUROT	REF	1	LAST	1210	TO 1219:	204	204 22318
26/P05	REF	1	LAST	1411	TO 1413:	32	32 22350
26/P06	REF	1	LAST	1410	TO 1411:	47	47 22397
26/P61	REF	1	LAST	740	TO 743:	61	61 22458
26/P62	REF	1	LAST	743	TO 746:	58	58 22516
26/P63	REF	1	LAST	746	TO 748:	20	20 22536
26/P64	REF	1	LAST	748	TO 749:	6	6 22542
26/P65	REF	1	LAST	749	TO 750:	27	27 22569
26/P66	REF	1	LAST	750	TO 751:	4	4 22573
26/P67	REF	1	LAST	751	TO 754:	36	36 22609
26/S61.1	REF	1	LAST	754	TO 759:	69	69 22678
26/S61.2	REF	1	LAST	759	TO 769:	179	179 22857
27/INTIN	REF	1	LAST	1296	TO 1298:	54	54 22911
27/P27	REF	1	LAST	1464	TO 1472:	248	248 23159
27/R60	REF	1	LAST	381	TO 385:	86	86 23245
27/R62	REF	1	LAST	389	TO 390:	11	11 23256
27/TFF	REF	1	LAST	1340	TO 1353:	268	268 23524
27/VECPT	REF	1	LAST	385	TO 389:	130	130 23654
30/P22	REF	1	LAST	553	TO 558:	194	194 23848
31/INIT	REF	1	LAST	896	TO 901:	115	115 23963
31/LNDMK	REF	1	LAST	892	TO 896:	150	150 24113
31/P37	REF	1	LAST	840	TO 849:	358	358 24471
31/R35	REF	1	LAST	886	TO 892:	223	223 24694
31/S23	REF	1	LAST	608	TO 620:	568	568 25262
32/P30	REF	2	LAST	634	TO 637:	72	177 25439
32/RTE	REF	2	LAST	854	TO 884:	844	950 26389
33/COMST	REF	2	LAST	430	TO 433:	161	475 26864
33/P03	REF	1	LAST	441	TO 443:	61	61 26925
33/P01	REF	1	LAST	433	TO 434:	41	41 26966
33/P02	REF	3	LAST	445	TO 448:	40	329 27295
33/P03	REF	3	LAST	444	TO 445:	22	128 27423

ROUTINE: COUNT DATA FOR ROUTINE'S LAST REACH:						TOTAL:	CUMUL
34/CONST	REF	1	LAST	443	TO 443:	26	26 27449
34/CRS61	REF	1	LAST	580	TO 587:	236	236 27685
34/P11	REF	2	LAST	533	TO 536:	84	328 28013
34/R22	REF	1	LAST	567	TO 580:	485	485 28498
34/R63	REF	1	LAST	606	TO 608:	41	41 28539
35/LUCRB	REF	1	LAST	587	TO 606:	772	772 29311
35/P17	REF	1	LAST	547	TO 550:	75	75 29386
35/P30	REF	1	LAST	625	TO 628:	82	82 29468
35/P34	REF	1	LAST	624	TO 625:	32	32 29500
35/P3474	REF	1	LAST	453	TO 458:	107	107 29607
35/P3575	REF	1	LAST	458	TO 477:	509	509 30116
35/R31	REF	1	LAST	494	TO 500:	194	194 30310
35/S3CS	REF	1	LAST	628	TO 632:	75	75 30385
36/INCOR	REF	2	LAST	1223	TO 1243:	196	332 30717
36/P11	REF	1	LAST	531	TO 533:	68	68 30785
36/TPI	REF	1	LAST	539	TO 546:	322	322 31107

ROUTINE: COUNT DATA FOR ROUTINE'S LAST REACH:						TOTAL:	CUMUL
37/CMBAT	REF	1	LAST	833	TO 840:	195	195 31302
37/P20	REF	1	LAST	550	TO 553:	84	84 31386
37/R21	REF	1	LAST	560	TO 562:	57	57 31443
37/R57	REF	1	LAST	558	TO 560:	53	53 31496
37/R61	REF	1	LAST	562	TO 564:	38	38 31534
37/SERV	REF	1	LAST	773	TO 795:	377	377 31911
40/EXTVB	REF	1	LAST	621	TO 624:	99	99 32010
40/PIN	REF	10	LAST	379	TO 381:	53	889 32899
41/PIN	REF	8	LAST	377	TO 379:	71	970 33869
42/NOUNS	REF	1	LAST	263	TO 278:	561	561 34430
42/PIN	REF	2	LAST	344	TO 347:	92	238 34668
42/R05	REF	1	LAST	884	TO 886:	80	80 34748
43/EXTVB	REF	4	LAST	247	TO 263:	287	615 35363
43/P27	REF	1	LAST	1463	TO 1464:	32	32 35395
43/SELF	REF	1	LAST	1359	TO 1368:	314	314 35709